HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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PUBLISHERS OF MACHINERY & MACHINERY'S HANDBOOK
The INDUSTRIAL PRESS

THIS MONTH'S COVER

The Reynolds and Reynolds Engraving Co. building in Dayton, Ohio, is air conditioned by a series of 5-ton Frigidaire conditioners such as the one shown in the front cover picture. This type of installation is described in the article beginning page 82.

Do you know where Air Recovery Equipment works best... pays the most?

Many architects and engineers have found it profitable to specify Dorex Air Recovery Equipment:

1. When the heating and cooling equipment cannot handle enough ventilating air to supply the fresh air demand.

2. When adequate ventilation requires bringing in large volumes of outdoor air *(which has to be conditioned at considerable cost).*

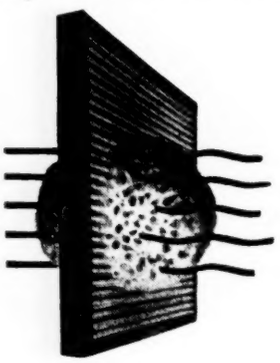
3. When it's difficult to bring in outdoor air or when the intake air isn't sufficiently *odor-free* for adequate ventilation.

Here's how it works when heating and cooling equipment is inadequate

The solution to the problem of improving air quality in railroad cars illustrates *why, how* and *where* you can profitably figure Dorex Air Recovery Equipment into similar high occupancy ventilating jobs such as hotels, restaurants, bars and some industrial plants.

A railroad train duplicates, in a concentrated way, practically every condition of human environment. The ventilation problem for the average train is complicated with a high concentration of odors emanating from people and their habits (body, respiratory, tobacco, cosmetics, etc.) and from food and beverages in preparation and service. Even industrial odors are encountered because the outdoor air intake picks up oil and combustion fumes, and other contaminants, depending on the type of locomotive and the district through which the train is traveling. Sometimes more than fifty persons, smoking and having refreshments, gather in a car designed to carry 22 to 24 passengers. Consequently, large volumes of dilution air are needed in order to maintain the air quality required to assure passenger comfort, night and day.

So the railroad design engineers sought an efficient method of producing more ventilation air without bringing in such great quantities of outdoor air that the power, weight and space limitations of the heating and cooling equipment would be exceeded.



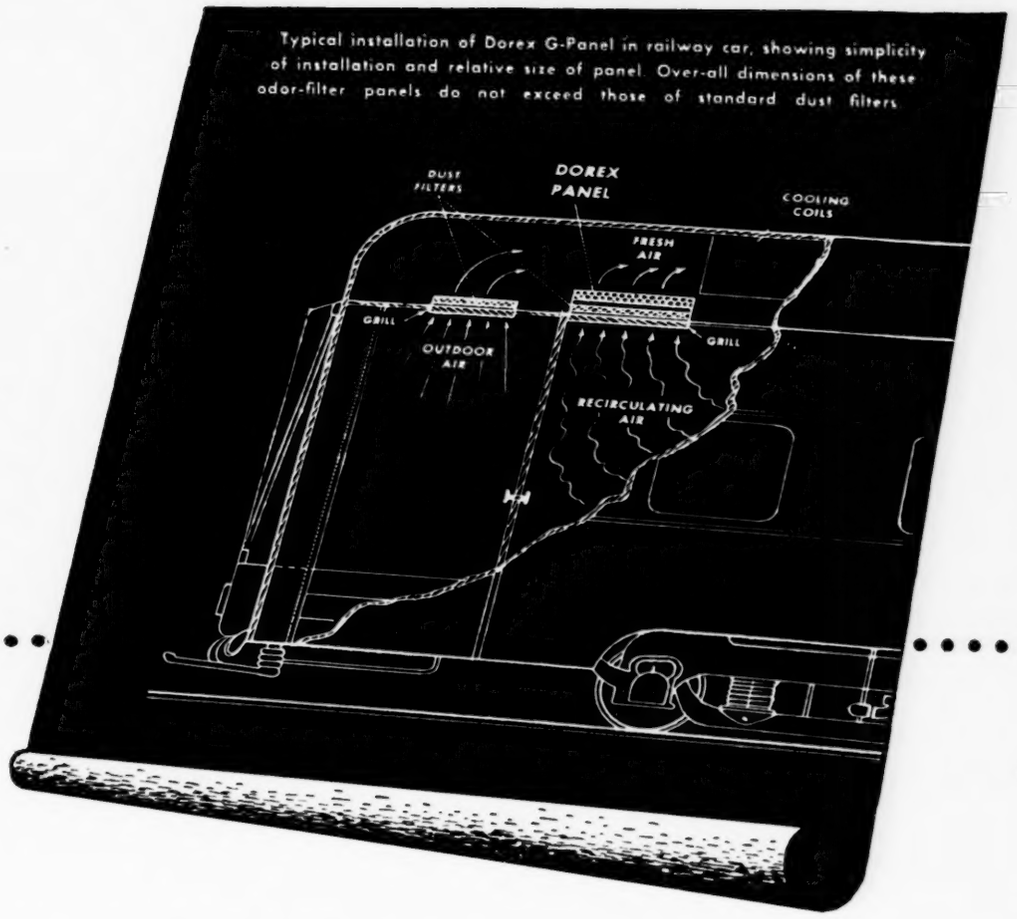
Dorex solved this problem by converting stale air to fresh air

Dorex overcame all limitations, provided fresh air comfort economically, and fitted into space that was already

It works like a sponge. The air circulates through beds of specially processed Dorex activated carbon granules which literally soak up the most minute traces of any odor. Average resistance to airflow added by the units is about 0.15" water-gage—a negligible percentage of the entire system.

DOREX Units are being used in:

Airplanes	Buses	Hospitals	Libraries	Railroad Cars
Banks	Chemical Plants	Hotels	Locker Plants	Refrigerated Storage
Bars	Stores	Industrial Plants	Offices	Restaurants
Bowling Alleys	Film Mfg. Plants	Institutions	Oil Companies	Telephone Exchanges
Breweries	Food Processing Plants	Laboratories	Precision Mfg. Plants	Theaters



Typical installation of Dorex G-Panel in railway car, showing simplicity of installation and relative size of panel. Over-all dimensions of these odor-filter panels do not exceed those of standard dust filters.

Some of the railroads now using DOREX Air Recovery Equipment

Atchison, Topeka & Santa Fe
Baltimore & Ohio
Boston & Maine
Chesapeake & Ohio
Chicago & Northwestern
Chicago, Burlington & Quincy
Chicago, Rock Island & Pacific
Denver & Rio Grande Western
Erie
Frisco Lines
Great Northern
Illinois Central
International Great Northern
Kansas City Southern
Louisville & Nashville
Minneapolis & St. Louis
Missouri-Kansas-Texas
Missouri Pacific
New York Central
New York, Chicago & St. Louis
New York, New Haven & Hartford
Norfolk & Western
Northern Pacific
Pere Marquette
Texas & Pacific
Union Pacific
Wabash

available. (See diagram.) By converting used air, that was already conditioned, to fresh air, Dorex supplied ample ventilation without imposing an additional load on the heating or cooling equipment. After seven years of thorough testing by American railroads, in which every imaginable method was tried, Dorex Air Recovery Equipment is specified for nearly all of the new cars on order and being installed in existing cars as rapidly as conditions permit. (See partial list above of railroads now using Dorex.)

Dorex Air Recovery Equipment uses *Activated Carbon*

Nothing is added to the air—odorous gases and vapors are *removed*, not disguised. Activated carbon, one of the most powerful adsorptives known, has been used for many years in industry for the collection of chemical gases and vapors. Thousands of current applications demonstrate its ability to *adsorb* the invisible odor-gases that make air stale, stuffy and odorous in commercial, industrial and public establishments.

W. B. CONNOR ENGINEERING CORP.
Air Diffusion • Air Purification • Air Recovery
112 East 32nd Street **New York 16, N.Y.**
IN CANADA: Douglas Engineering Co., Ltd., 190 Murray Street, Montreal 3, P. Q.

FREE LITERATURE
Shows how to save money on air conditioning

Bulletins 105-A and 106-A, listed below, are handbooks. Both contain all the detailed drawings, charts and text necessary for the selection and application of Air Recovery Equipment and some typical installations. They also cover pertinent information on ventilation, oxygen requirements, and recommended fresh air volumes for offices, stores, apartments, hotels, restaurants, night clubs, theaters, hospitals and schools. The third bulletin contains the unbiased report of an independent research organization on Air Recovery and its effect on air conditioning quality and costs. York Research Corporation of Connecticut made the investigation for the American Hotel Association. Since their recommendations can be applied to many other installations besides hotels, the Association has given us permission to offer this report to anyone interested in cutting the cost of air conditioning.

PLEASE CHECK THE BULLETINS YOU WANT; FILL OUT AND MAIL THE COUPON BELOW.

☐ Bulletin 105-A Type H Air Recovery Canisters. The canisters are adaptable to most central type conditioning systems for recovering the freshness of recirculated and intake air and for eliminating exhaust air nuisances.

☐ Bulletin 106 A Type G Air Recovery Panels. These compact panels are installed like dust filters and are especially designed for "package" units, refrigerated spaces, airplane, bus, railway car and maritime installations and other systems where space is at a premium.

☐ Research Report on "Air Recovery and Odor Control in Air Conditioning Systems" prepared for the American Hotel Association by the York Research Corporation of Connecticut.

W. B. CONNOR ENGINEERING CORPORATION
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Please send me the bulletins checked above.

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YOUNG ANNOUNCES . . . .

New, Circular "VERTIFLOW" UNIT HEATERS

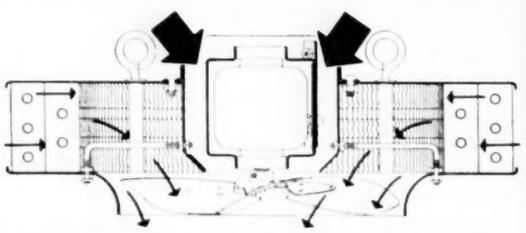
Three Types of Diffusers Offer Wide Range of Application

YOUNG "AERO-JET" NOZZLE increases maximum mounting heights nearly 30%. Steps up air velocity.

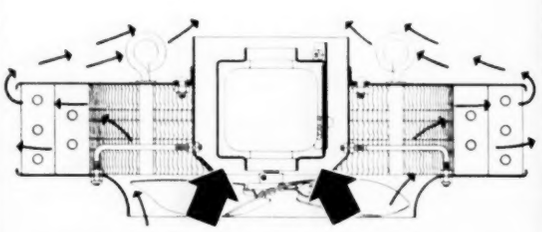
YOUNG "SPREAD-AIRE" DIFFUSER for space heating in areas where elevations are of medium height.

3 OR 4 CONE ANEMOSTATS are available for lower installations where thorough mixing is desired.

"VERTIFLOW" by Young Offers Protective Motor Cooling



MOTOR ON • Fan draws air through core and blows it downward. Simultaneously, room air is drawn through ventilating stack (indicated by large arrows) keeping motor cool.



MOTOR OFF • Radiant heat from core rises. Since ventilating stack (indicated by large arrows) is open at both ends, core heat creates "chimney" effect, protects motor from "baking" by drawing cooler room air upward through stack.

HOW TO GET EFFECTIVE HEATING FROM HIGH CEILING INSTALLATIONS

Increased airflow and lower final air temperatures of the new, circular "Vertiflow" Unit Heater make it possible to heat floor areas from greater heights than previously practical . . . thereby providing greater heating efficiency with fewer units. Young Engineers—specialists in heating, cooling and air conditioning equipment since 1927—have accomplished this by improved fan design and specially engineered heater cores. The new, Young heating element provides correct final air temperatures, maintains more even heat at thermostat levels, and eliminates excessive air buoyancy, which causes over heated air to rise before reaching the floor areas. An added bonus in assuring trouble-free installations is the patent-applied-for, protective motor cooling principle. It prevents motor-baking by radiant heat from the core. Young-designed diffusers and "Anemostats" are available for specific installations.

Send for Free Catalog

Young "Vertiflow" Catalog No. 2648 is just off the press. It gives complete descriptions, ratings and specifications for the 7 "Vertiflow" Models which deliver from 52,600 to 552,000 Btu per hr under standard conditions. Send for your free copy today!

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HEATING, COOLING AND AIR CONDITIONING PRODUCTS
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NO HEATING INTERRUPTIONS

with "GUN-PAKT" JOINTS

REVOLUTIONARY IDEA PERMITS SERVICING *UNDER FULL STEAM PRESSURE*

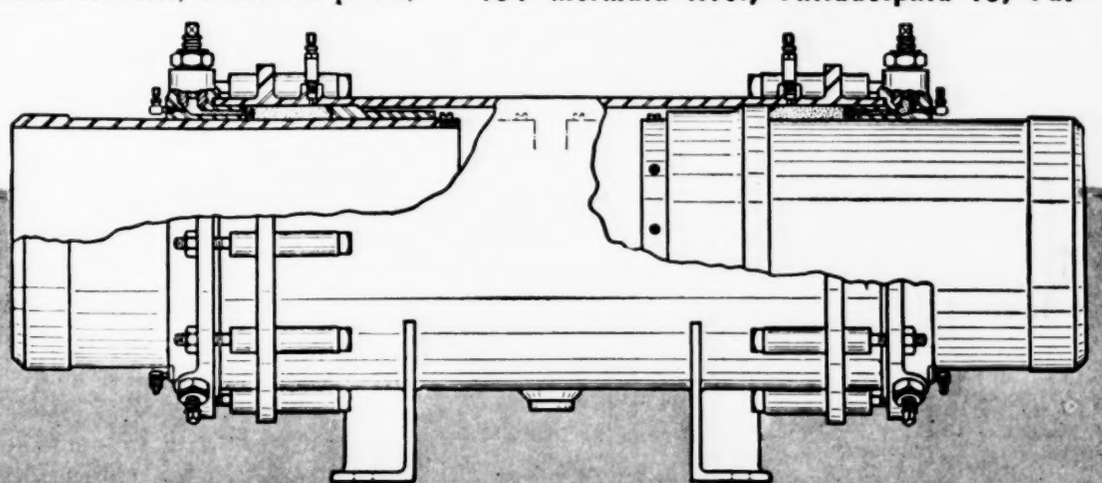
Shutdowns and service interruptions to add packing to expansion joints are things of the past.

Why? Because "Gun-Pakt" Joints *can be serviced under full steam pressure.* Insert a packing plug . . . twist a wrench . . . the joint's tight, the job's done. New Yarway packing rejuvenates the old.

The record proves . . . "Gun-Pakt" means minimum maintenance. Utilities, industrial plants, institutions, public works and other plants using steam distribution systems report savings of thousands of dollars annually in maintenance and operating costs with Yarway "Gun-Pakt" Joints.

To find out more, read Yarway Bulletin EJ-1911. It's free. Write today.

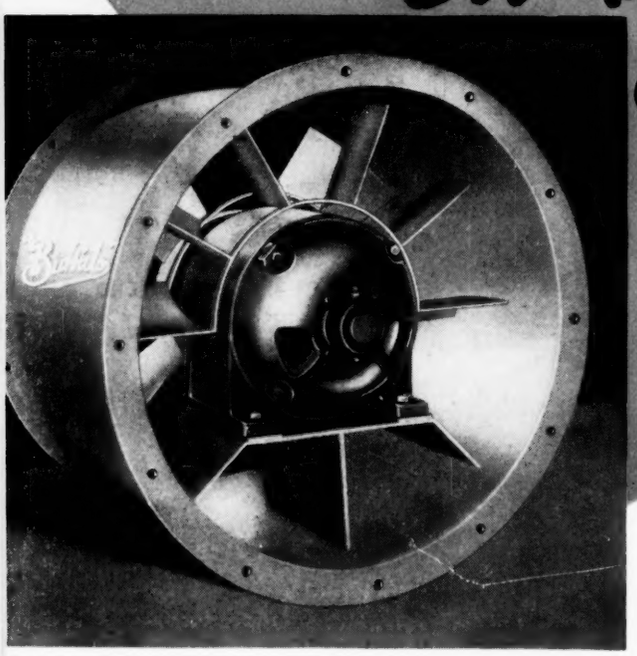
YARNALL-WARING COMPANY
104 Mermaid Ave., Philadelphia 18, Pa.



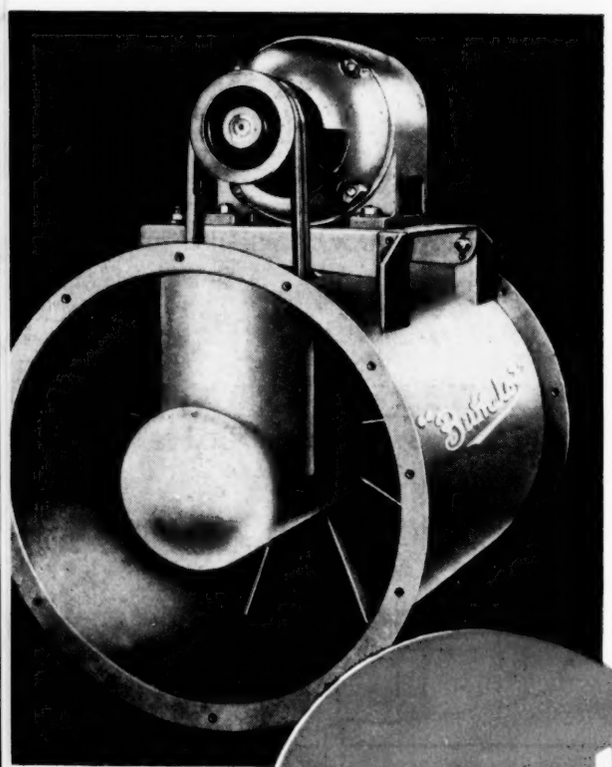
Sectioned drawing of double-end, welding-type Yarway "Gun-Pakt" Joint.

YARWAY GUN-PAKT EXPANSION JOINT

Here are your FACTS on "Buffalo" Axial Flow Fans



Falo Type "B" Vaneaxial Fan, direct drive, arrangement four



Arrangement 2, belt-driven Vaneaxial. Note belt fairing for streamlining and protection of belt from air stream.

Whether you install a centrifugal or an axial flow fan is, of course, a matter of judgment in the light of ventilating principles. "Buffalo" builds both types. In certain cases, the Axial Flow offers superior air handling and more advantageous installation. This is why we think Bulletin 3533-C should be in the possession of everyone who buys or recommends ventilating units.

WHEEL Design Is Right

The "Buffalo" design includes a large, correctly shaped hub which prevents re-entry losses typical of the propeller type fan. Blades have a change in pitch from hub to tip—giving more even flow of air over the entire blade surface, resulting in more air at slower speeds.

HOUSING Design Is Right

For mounting in straight portions of ducts, the "Buffalo" Axial Flow Type "B" generally gives the highest efficiencies. Buffalo stationary directional vanes at the discharge side of the wheel give you Bee-line air delivery — straight through, with no loss from turbulence.

Compact, Light, Ideal FOR MANY INSTALLATIONS

Where light weight is a consideration, where space is short, where no bad duct connections are required, you will find Type "B" Axial Flows the best answer to your light duty ventilating applications.

"Buffalo"

AXIAL

YOUR COPY! Write for *Bulletin* 3533-C, describing construction and performance of Buffalo Tubeaxial and Vaneaxial Fans — and including valuable data on selection of Axial Flow and Centrifugal types.

Fan shown on cover of Bulletin 3533-C at right is a Type "B" Belt-Driven Vaneaxial

BUFFALO FORGE COMPANY

480 BROADWAY BUFFALO 4, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

FLOW FANS

THE *Responsibility* OF COMMUNITY LEADERSHIP

YOU as a leader in your community have a sacred obligation--to yourself, your family, your neighbor and your country, Use your experience and knowledge to the full extent of your ability to shape a public opinion which will help to establish right and justice for a lasting world peace, and preserve our country's cherished heritage of freedom for the individual.

Only through the intelligent, active work of community leaders can we keep America as the impregnable citadel of liberty and freedom.

The Youngstown Sheet and Tube Company

General Offices--YOUNGSTOWN 1, OHIO
Export Offices-500 Fifth Avenue, New York
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS
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The air conditioning system to cool this entire building is powered by Century Electric motors.

The RIGHT Century MOTOR for Every Air Conditioning Application Contributes to Continuous Long-Life Performance and Economical Operation

Here's an interesting example showing how the engineered selection of Century motors accurately meets the exacting demands of large air conditioning installations. The wide range of types and sizes of Century motors permits selection of the right motor for any heating, cooling, circulating, pumping or compressor application.

1 and **2** — Two Century type SR Slip Ring motors (125 and 200 horsepower) were selected to drive the high speed compressors because they have the necessary high torque to bring these centrifugal compressors up to full speed quickly. Speeds up to 9,000 RPM are supplied by using a speed increasing gear mechanism.

3 — Century type SC 25 horsepower Squirrel Cage Normal Torque motor drives a centrifugal pump.

4 — Century type SC 50 horsepower Squirrel Cage Normal Torque motor drives a chilled water pump—and a similar 20 horsepower motor drives a condenser water pump.

These Century pump motors easily handle the centrifugal pumps, since they require a small amount of starting torque.

5 — Century 1½ and 3 horsepower type SC motors drive fan and coil units.

6 — Century Splash Proof motor provides weather protection for this outdoor installation on a cooling tower fan.

Century builds a wide range of motor types in sizes from 1/6 to 400 horsepower to assure top performance for every electric power application.

Specify Century for all your electric power requirements.

CENTURY ELECTRIC CO. • 1806 Pine Street • St. Louis 3, Missouri

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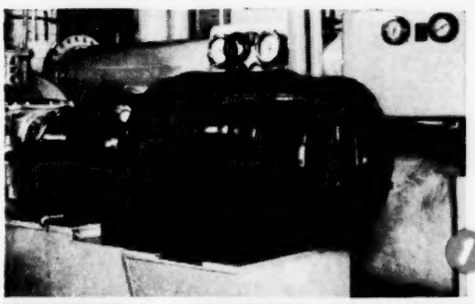
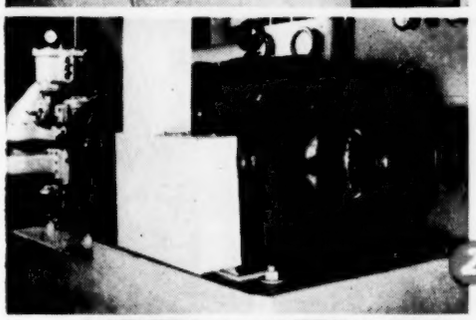
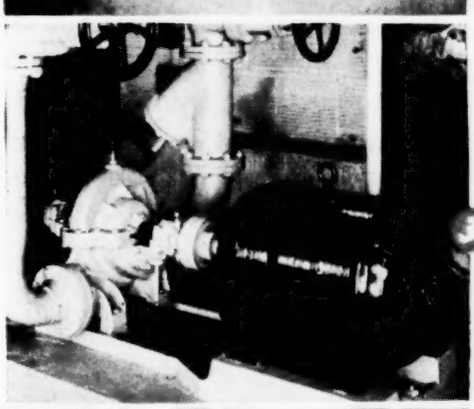
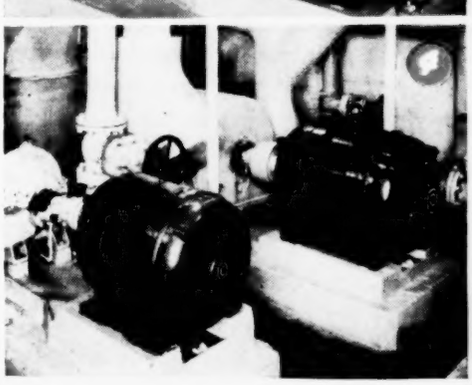
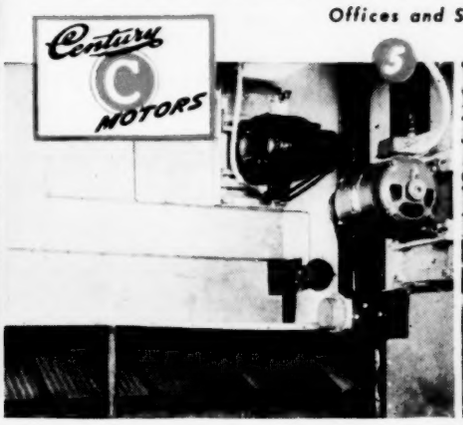
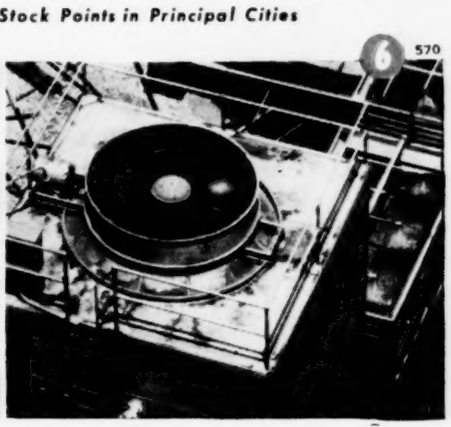




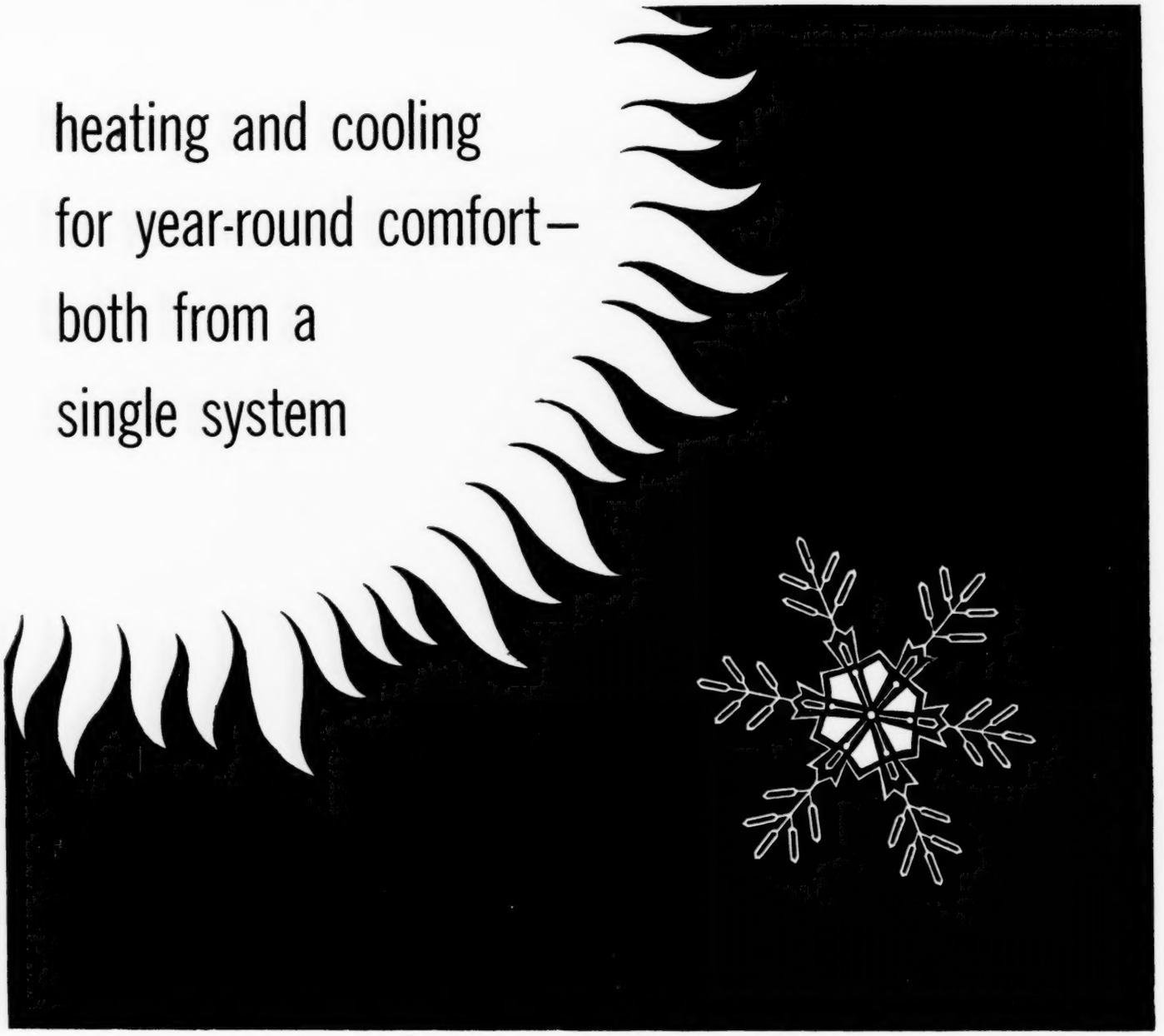








heating and cooling for year-round comfort– both from a single system



There's no winter lay-off for Carrier Conduit Weathermaster air conditioning . . . no planning a separate, costly heating system for the cold months. With this modern, flexible air conditioning, any multi-room building can have economical comfort in every room any season *with a single system.*

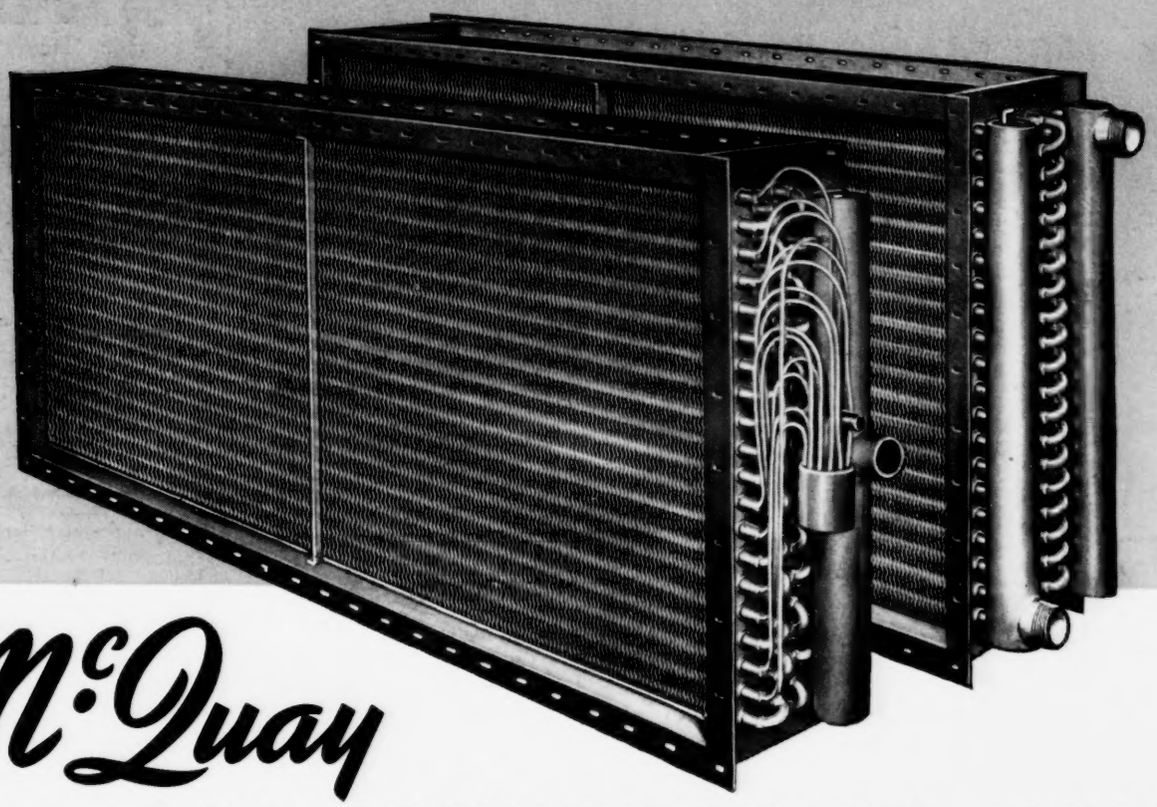
Both cooling and heating are furnished by the same compact individual room unit located under the window. That's space and money saved. The room units have no moving parts to need service and replacement. That means quiet operation, low maintenance costs.

Individual room control lets tenant or guest choose the temperature he wants at the twist of a simple valve. Since there is no interroom recirculation, there's no transfer of noise or odors. Space saved by small-diameter conduit gives the owner more rentable area. For buildings up to five stories, there's the Carrier Duct-type Weathermaster system. This, too, provides room-by-room temperature control and year-round heating and cooling.

Carrier systems are designed and built with the same unrivaled skill that created the air conditioning industry. They're bringing dependable air conditioning to the world's best-known hotels, office buildings, hospitals, apartments, stores, factories and steamships. Carrier's experienced engineers for years have worked closely with architects and consulting engineers to bring the utmost in air conditioning comfort to each individual installation. Carrier Corporation, Syracuse, New York.

Carrier **AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING**

HYDRAULIC EXPANSION
means better contact!



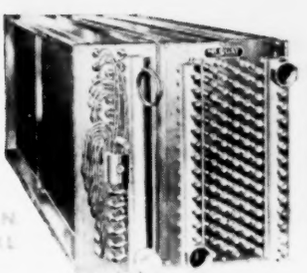
McQuay

AIR CONDITIONING COILS

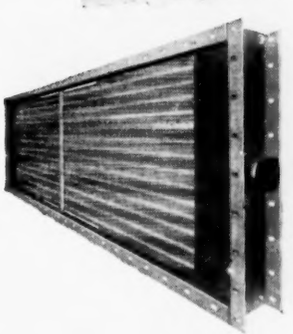
Superior contact fin to tube—assured turbulence of the heating or cooling medium—two reasons for top performance in McQuay air conditioning coils. Exclusive Ripple-Fin coils are formed by a process in which copper tubes are hydraulically expanded into plate type aluminum fins under pressures up to 4500 PSI, assuring maximum heat transfer between primary and secondary surfaces. Rippled inside tube surfaces, created in the expansion process, add necessary turbulence to the liquid or gas medium for greater heat transfer.

Practically limitless in range of sizes and capacities, McQuay coils for water, steam, direct expansion or combination uses are engineered to meet your requirements. See your McQuay representative or write McQuay, Inc.

Representatives in Principal Cities.



COMBINATION COIL



STEAM BLAST COIL

McQuay Inc.

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Minneapolis 13, Minnesota

HEATING • AIR CONDITIONING • REFRIGERATION

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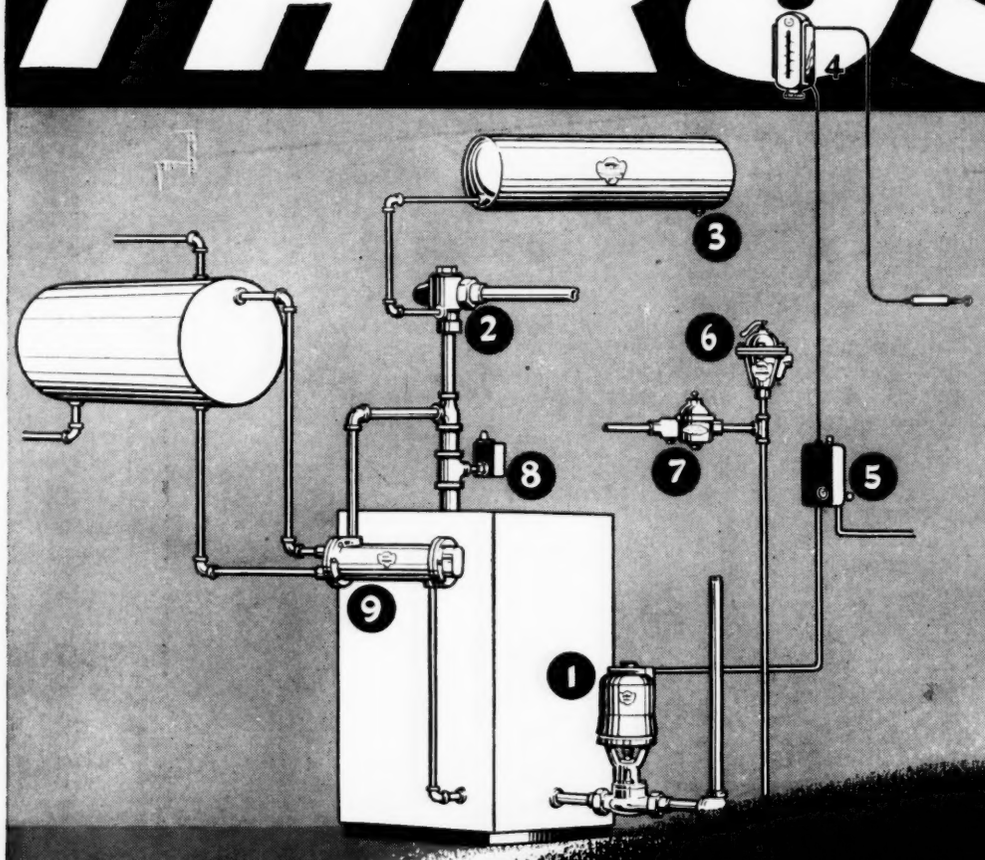

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3. Pressure Tank
4. Radiant Heat Control
5. Relay Transformer
6. Water Pressure Relief Valve
7. Automatic Filling Valve
8. Boiler Water Temperature Control
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WRITE FOR your copy of this beautiful new booklet giving all the advantages of Forced Circulating Thrush Flow Control System. It is written to appeal to home owners and will help you sell more Thrush Systems. Installing this finest and most economical form of home heating will build your reputation and increase your business. Get all the facts now. Ask your wholesaler today or address Dept. D-4

H. A. THRUSH & COMPANY · PERU, INDIANA

For Replacement Lines it's easier to use

ANACONDA COPPER TUBES

The North Side Branch of the People's First National Bank and Trust Co., Pittsburgh, Pa.

Above is shown a portion of the copper tube installation. This section of replacement lines is between the roof and top floor ceiling.

MORE AND MORE, progressive plumbers are installing Anaconda Copper Tubes for replacement purposes in commercial and industrial buildings.

You can easily see how copper tubes with soldered fittings save time. You'll also find them easier to install in cramped spaces with minimum damage to walls and floors. And you know they'll give rust-free, economical service.

A good example is provided by the job shown here. George W. Shaney, Pittsburgh contractor, used 6,000 feet of Anaconda Type K Tubes in sizes from ½" to 3".

In new construction, we recommend SPS "85" Red Brass Pipe . . . today's nearest approach to piping permanence. This famous Anaconda product, containing 85 percent copper, is outstanding for high quality and dependability proved by years of service in commercial, residential and industrial applications.

4730

ANACONDA
from mine to consumer

Anaconda

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Subsidiary of Anaconda Copper Mining Company

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Easier . . . Faster . . . Smoother Piping Jobs when CRANE-equipped throughout

For power, heating or process piping . . . whatever you need, Crane is the dependable source. Buying from the world's most complete line means delivery of what you want . . . valves, fittings, pipe, accessories, fabricated piping . . . in brass, iron, steel or alloys.

Standardize on Crane and you establish a single responsibility for piping equipment. Every step of piping procedure is simplified . . . specifying, buying, installing; including maintenance work. And you're assured good performance, because dependable Crane quality guards every part of piping systems.

Pick up your Crane Catalog and the complete Crane line becomes your partner . . . working for you.

Crane Co., 836 S. Michigan Ave.,
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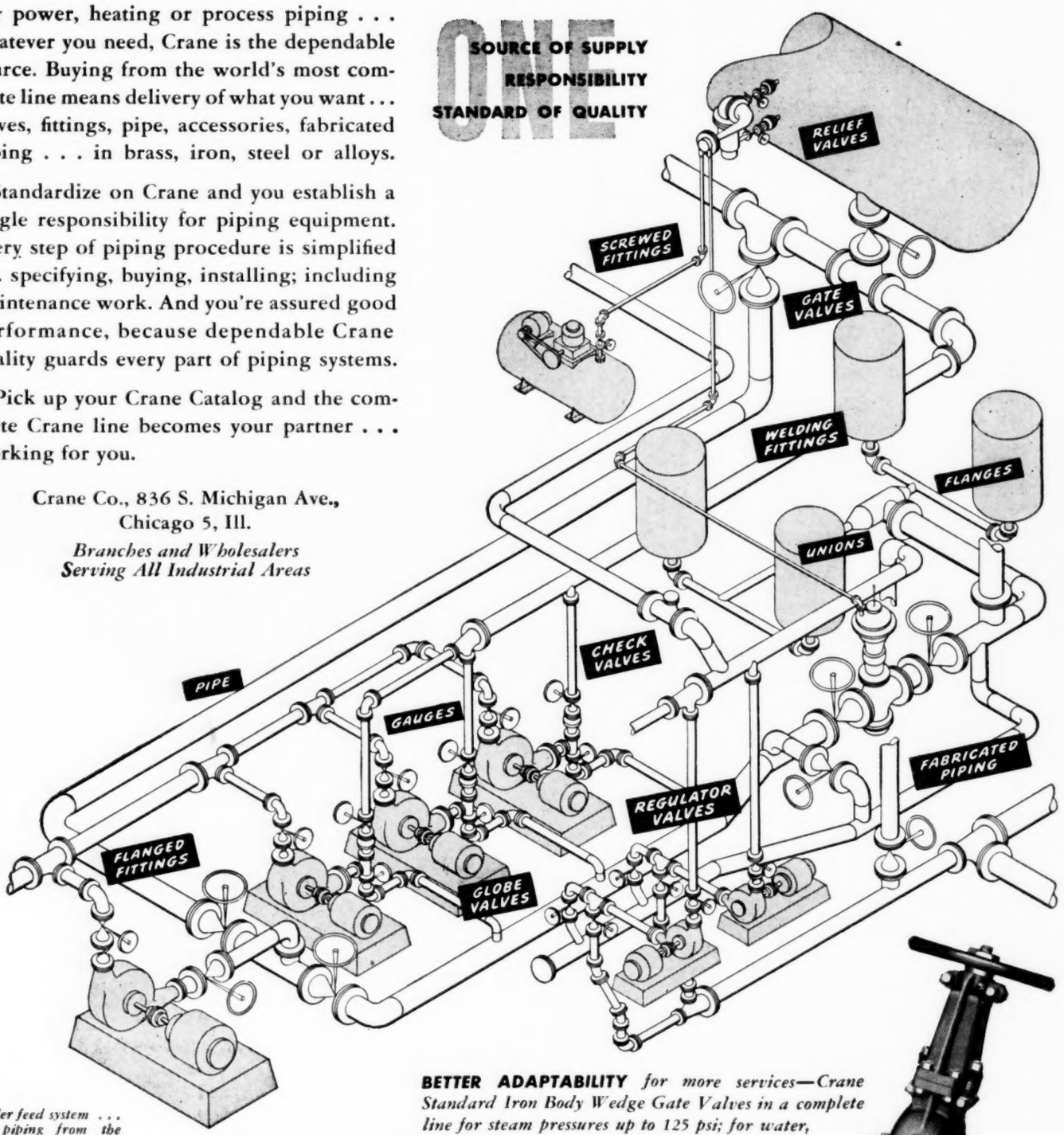
Branches and Wholesalers
Serving All Industrial Areas



Boiler feed system . . . all piping from the complete Crane line.

BETTER ADAPTABILITY *for more services—Crane Standard Iron Body Wedge Gate Valves in a complete line for steam pressures up to 125 psi; for water, oil or gas up to 200 psi. Made in outside screw and yoke, and non-rising stem patterns; screwed or flanged ends; brass-trimmed or all-iron. In sizes 2 in. and larger. See your Crane Catalog, pp 101-6.*

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM

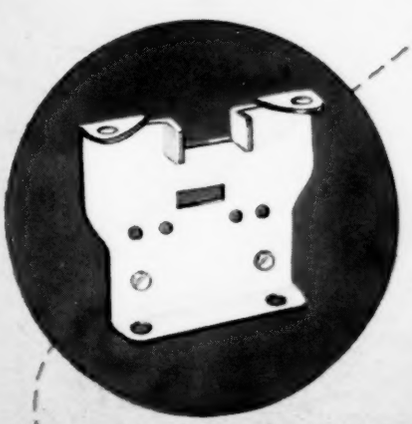
Weirzin

ELECTROLYTIC ZINC-COATED SHEETS AND STRIP

Reduces Die Cost

BY LENGTHENING DIE LIFE

Weirzin has a tight electrolytic zinc coating that lubricates dies without danger of leaving a zinc deposit. Die maintenance expense is thereby sharply reduced, and the life of the die increased.



A specific example of this, reported by a fabricator, relates that instead of the usual production run of 100,000 pieces from dies when using ordinary carbon steel, change to Weirzin increased production to over 400,000 pieces. This 300% average increase in production per set of dies is too great a factor in present-day costs to be ignored. You might find such an opportunity in your own plant.

The most severe fabricating operations will not cause Weirzin to peel, flake or powder. Its electrolytic zinc coating remains intact under deep drawing or difficult forming and bending operations without deterioration. For more specific information, write

WEIRTON STEEL COMPANY

NATIONAL STEEL

WEIRTON STEEL CO.

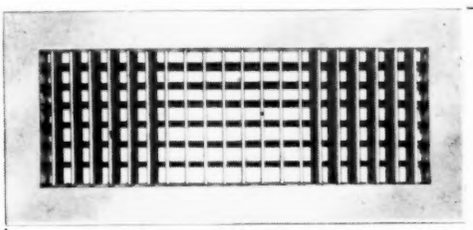
WEIRTON, W. VA. • *Sales Offices in Principal Cities*

Division of NATIONAL STEEL CORPORATION • *Executive Offices, Pittsburgh, Pa.*

T&B STANDARDS

When you specify T&B STANDARDS, you get on-the-shelf stock that means quick job completion . . . no waiting for delivery of grilles and registers . . . no delays to boost installation expenses. And size standardization has other important advantages. Costs are cut by mass production methods, guesswork is eliminated in the selection of correct sizes.

Check the requirements of your next air conditioning job . . . then install *standard* TRI-FLEX and AEROVANE sizes. Your customers will appreciate their performance, attractive appearance and economy.

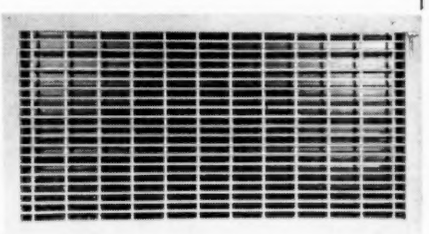


Tri-Flex

Available as Grille, Double Deflection Grille (shown), Multi-Shutter Register, or Double Deflection Multi-Shutter Register

Aerovane

Available as Grille, or Register (shown)



Bulletin 47TF gives detailed description, engineering data and complete information for specifying and installing. Write for copy today.

TUTTLE & BAILEY, Inc.

NEW BRITAIN, CONNECTICUT

8TB48

Here's how the "unbeatable combination" can protect you

MODERN hard coal stokers and clean, dependable anthracite are an unbeatable heating combination. This pair offers your tenants and property these important benefits.

Completely Automatic Heat—Modern hard coal stokers are fully automatic... from bin feed to ash removal. Sensitive thermostatic controls respond to the slightest change in temperature. They go to work immediately to send steady heat throughout the building.

Plenty of Heat—A full year's supply of plentiful, small size anthracite can be stored without danger. Every day, regardless of the temperature outside, the building is healthful, comfortably warm. Tenants are satisfied . . . investments and income protected.

Economical Heat—Stokers use the smaller, inexpensive sizes of hard coal. Thousands of satisfied owners of anthracite stokers testify to reduced fuel bills . . . *as much as 50% lower!*

Get all the facts on heating with all types of anthracite equipment including modern automatic stokers. Simply fill out the coupon and send it *today*.

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Company_____

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A GREAT NEW COIL JOINS

TRANE Announces a Major Advancement in Non-Freeze Coils

Here is a radically improved line of tube-within-a-tube coils. The steam distributing tubes in these new coils are equipped with *kinetic orifices.*

These amazing orifices feed steam faster; cause condensate to be eliminated faster. Protection against freezing is multiplied. The coils are non-stratifying. There is greater steam modulation. Coil capacity is sharply increased.

With an ordinary tube-within-a-tube coil, steam is released to the condensing tubes through a series of small, flush holes in the steam distributing tubes. In practical operation, steam from these small holes strikes the walls of the condensing tubes and mushrooms in all directions. This retards condensate flow; actually holds it up in the tubes. Result: the coil has the capacity of a *hot water coil.*

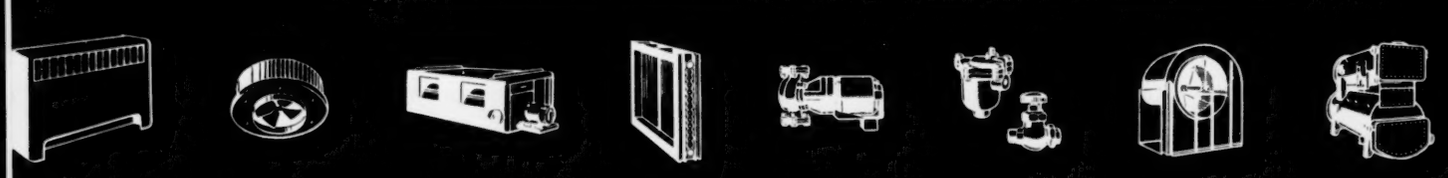
Trane's new *kinetic orifices* overcome these difficulties. Extending beyond the surface of the steam distributing tubes, they induce a jet flow of steam IN THE SAME DIRECTION THE CONDENSATE TRAVELS. Kinetic energy of the steam is imparted to the condensate, literally pushing it out of the coil, and *bringing live steam in rubbing contact with the condensing tubes.* Result: the great new line of Trane SD Coils delivers FULL STEAM CAPACITY—a capacity increase of 15% over old types—without any increase in size, weight, or price.

We sincerely believe that the announcement of this remarkable Kinetic Orifice marks the greatest advancement in non-freeze coils since the introduction of the steam distributing tube.

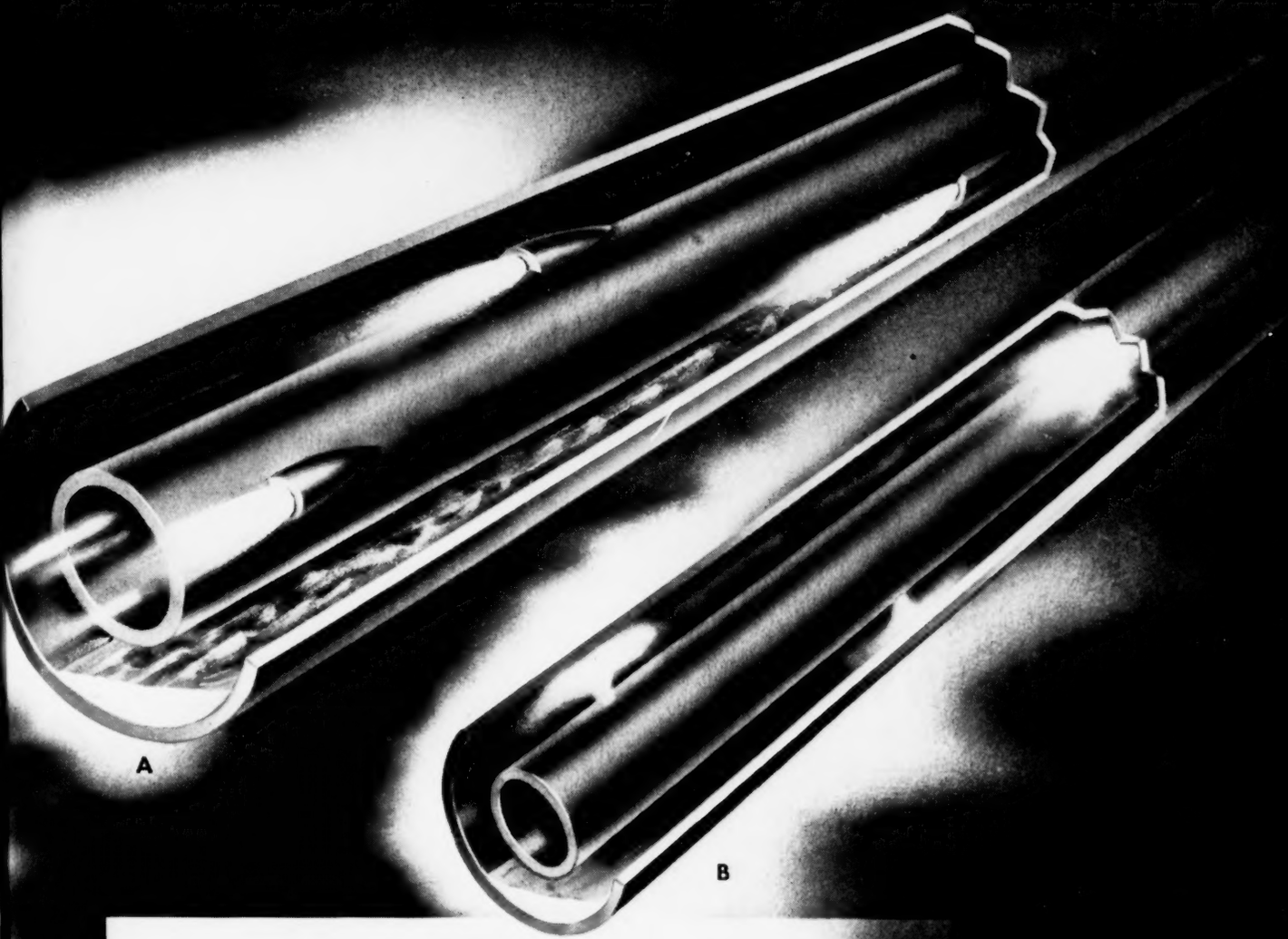
The Kinetic Orifice is an example of the constant effort of Trane engineers to keep the great Trane line of heating and air conditioning equipment in the forefront of industry. So complete is this line that architect, engineer and contractor can select exactly the right combination for any application.

And since these products are designed together and built together for use together, a perfectly integrated, up-to-the-minute system is secured. You have a made-to-measure system; an undivided responsibility system.

You pay no price bonus for Trane products. Trane factories use modern line production, and the mass production economies are passed along to you in the form of higher quality. Over 200 Trane field engineers in 85 principal cities offer their constant co-operation. THE TRANE COMPANY, LA CROSSE, WISCONSIN. Also: TRANE COMPANY OF CANADA, LTD., TORONTO, ONTARIO.



A GREAT LINE OF PRODUCTS



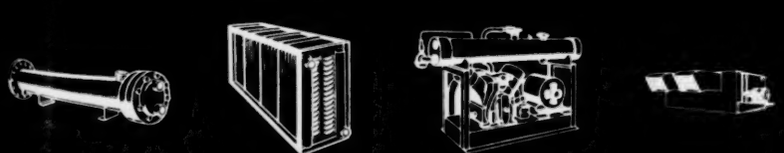
The Trane KINETIC Orifice

The Old Way: Note, at "B," how steam released from flush holes in the steam distributing tube strikes the wall of the main tube and mushrooms in *all* directions. This holds back condensate; reduces coil capacity.

The Trane Kinetic Orifice Way: Illustration "A" shows how the Trane Kinetic Orifice is designed to release steam in the direction of condensate flow, causing positive accelerated flow. Mushrooming, stratification, freezing eliminated. Capacity increased 15% without increase in weight, size, or cost.

New Trane Kinetic Orifice Coil*: At left is shown a typical new Trane SD Coil, designed for same-end connections. A complete line of the new SD coils is available for either same-end or opposite-end connections.

*Patents pending



TRANE

HEATING AND AIR CONDITIONING

QUESTION:

When you replace worn-out oil burners with Petro, what do *you* gain?

ANSWER:

UNWILLING to nurse along their present worn-out fuel-wasting oil burners, many homeowners are getting set to put in modern equipment that can and does give most heat with least fuel.

That means Petro . . . for every reason you can think of. To the homeowner a Petro brings such fuel-saving features as the patented "tubular atomizing nozzle." Plus basic design efficiency reflecting the more than 45 years' "know how" of the world's largest, oldest exclusive oil burner maker. Plus built-in sturdiness so essential to fine performance for years.

Add these benefits up in terms of owner satisfaction and you'll agree a Petro stands in front in promoting *any dealer's* reputation for quality merchandise and workmanship. For details on Petro oil burners, boiler-burner units, furnace-burner units and water heaters, see the established Petro heating and plumbing jobber in your wholesale trading area. Do it now!

PETRO

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OIL BURNERS • BOILER-BURNER UNITS
FURNACE-BURNER UNITS • WATER HEATERS

PETROLEUM HEAT AND POWER COMPANY
Stamford, Connecticut

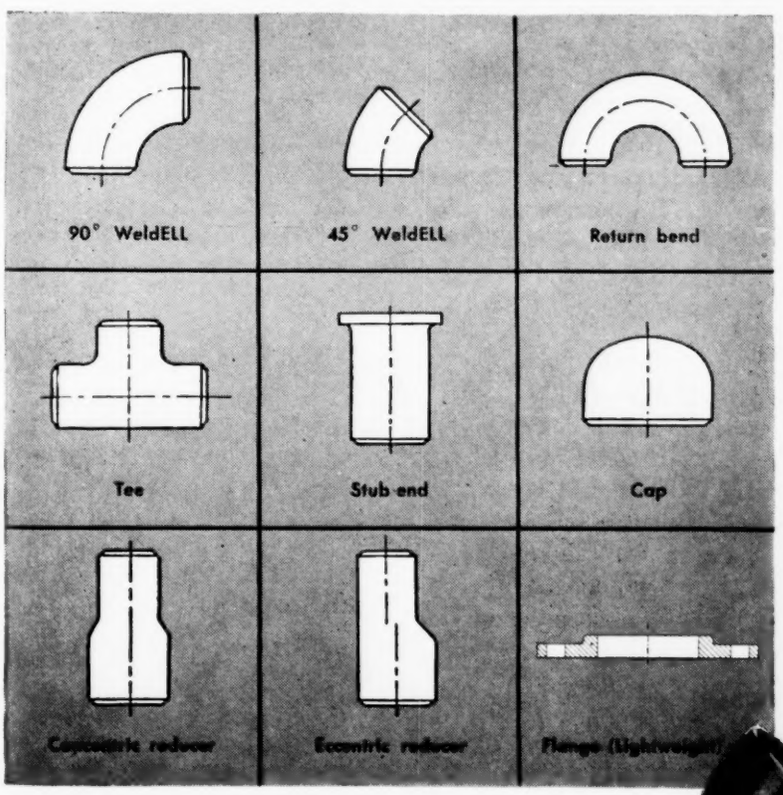
Makers of Good Oil Burning Equipment Since 1903

REFINERIES FUEL OIL STORAGE AND DISTRIBUTION TERMINALS
NATIONWIDE OIL BURNER SALES AND SERVICE FACILITIES

Name the problem—

- *High temperature*
- *Low temperature*
- *Product purity*
- *Corrosion resistance*

Here's the answer!



Taylor Forge Welding Fittings and Flanges are available in:

Stainless 304, 316, 347, Monel, Inconel, Nickel, Copper . . . also other usual industrial metals.

Fitting sizes: ¾" through 12" and larger. Wall thicknesses: schedules 40-S, 80-S, 10-S and others. Flange sizes: ¾" through 30" and larger. Coupon brings dimensional data.

☐ Send Taylor Forge Bulletin 476 covering stainless steel welding fittings and flanges.

☐ Add my name to your general mailing list.

Name_____

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511-0448

Mail to Taylor Forge & Pipe Works
P. O. Box 485, Chicago 90, Ill.

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& PIPE WORKS

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look-no hands!

this is your heating superintendent when you heat with Dravo Heaters

It's an *automatic* fireman who goes on the job at the flip of a switch for the Sanatex Company of Chicago. It cuts operational and maintenance expense to the bone and solves what had appeared to be an expensive heating problem for this processor of wiping cloths.

Not only is an attendant unnecessary—boiler-room and ductwork expense was eliminated, too, by installation of a Dravo *Counterflo* Heater. Centered along the east wall, the Dravo *Counterflo* Heater is entirely self-contained—requiring only power and fuel lines and a small vent stack. Its 1,000,000 BTU output is directed slightly over the heads of the workers to blanket 10,000 square feet of unbroken plant area with draft-free warm air. Cold corners and excessive roof heat loss are eliminated. During summer months, a touch of the selector switch converts the Dravo *Counterflo* Heater immediately into a powerful air-circulating unit.

Dravo *Counterflo* Heaters are available in sizes ranging from 400,000 to 2,000,000 BTU output. Equally efficient with oil or gas and with or without ductwork, they can be floor-installed, wall-hung or roof-hung. Write for Bulletin GC-516. Heating Section, Dravo Corporation, Dravo Building, Pittsburgh 22, Pennsylvania.

According to Mr. Schulman, President of Sanatex Company, the Dravo *Counterflo* Heater "is the best equipment we ever had. Delivery of heat is virtually instantaneous when the unit goes into action—an important fuel-saving feature which eliminates the need for anticipating cold spells or keeping the heater in operation when the plant is closed."

PITTSBURGH · CLEVELAND
PHILADELPHIA · DETROIT
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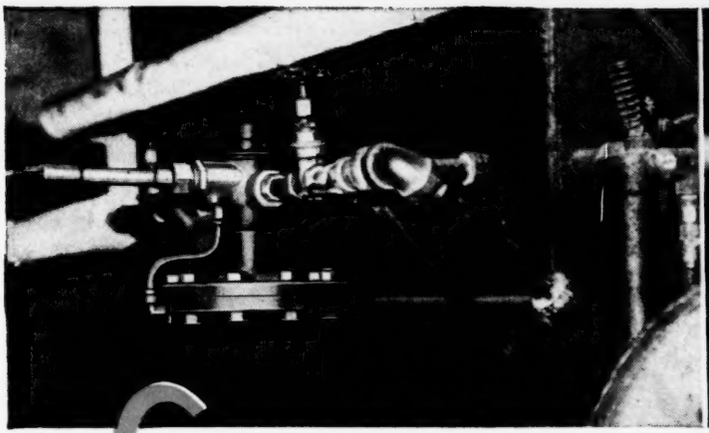
DRAVO

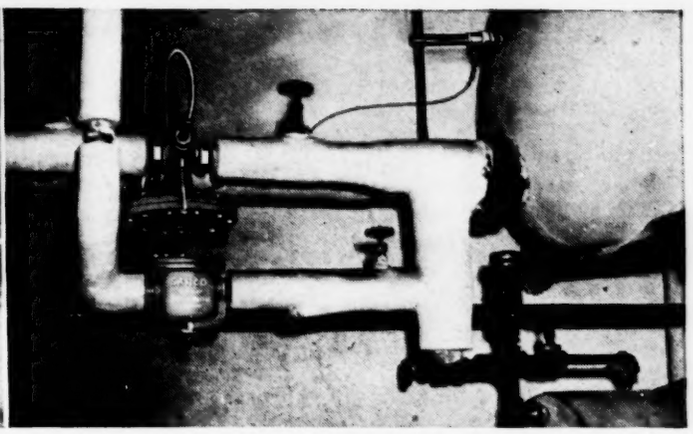
Dravo also manufactures the *DRAVO CRANE CAB COOLER* for air conditioning hot-metal crane cabs.

DRAVO CORPORATION

Sales Representatives in Principal Cities

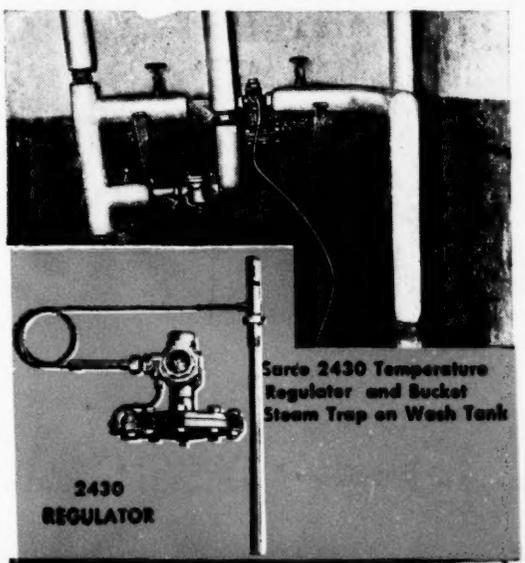


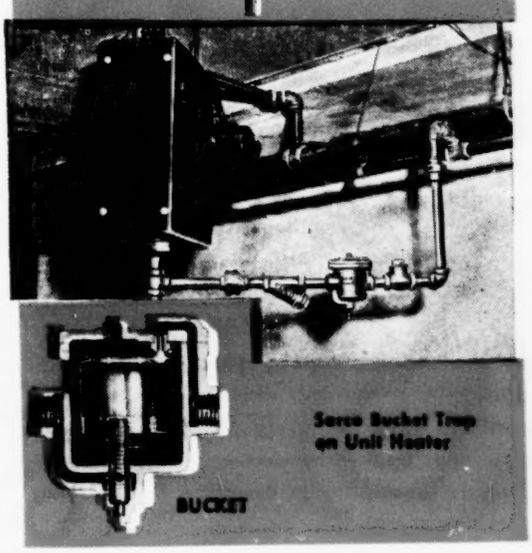
Sarco 2430 Temperature Regulator on Solvent Tank



Sarco 2430 Regulator and Bucket Trap on hot water generator

SERVICE WITH A BIG





The speed up and fuel economies of mass production in this Southern auto repair plant have resulted in a reputation for quality, promptness of service and reasonable prices which is recognized for miles around.

The base for all operations is hot water which is generated automatically as needed under the guidance of the Sarco 2430 temperature control. Little water is wasted, no products spoiled—no time lost—because the temperature is always right.

Special solvent tanks and all wash tanks are also protected by this control which insures uniform results, day in and out, regardless of the amount of work going through.

To further insure plenty of heat, and no stoppages due to foreign material in the steam lines, the combination of Sarco Bucket Traps and Sarco Strainers is used at every point.

These are only two of the Sarco Products that are producing new economies in quality and quantity of production and fuel savings in all kinds of heat using industries. The Sarco Representative near you can show you how.

173

SARCO SAVES STEAM

SARCO COMPANY, INC.

Represented in Principal Cities

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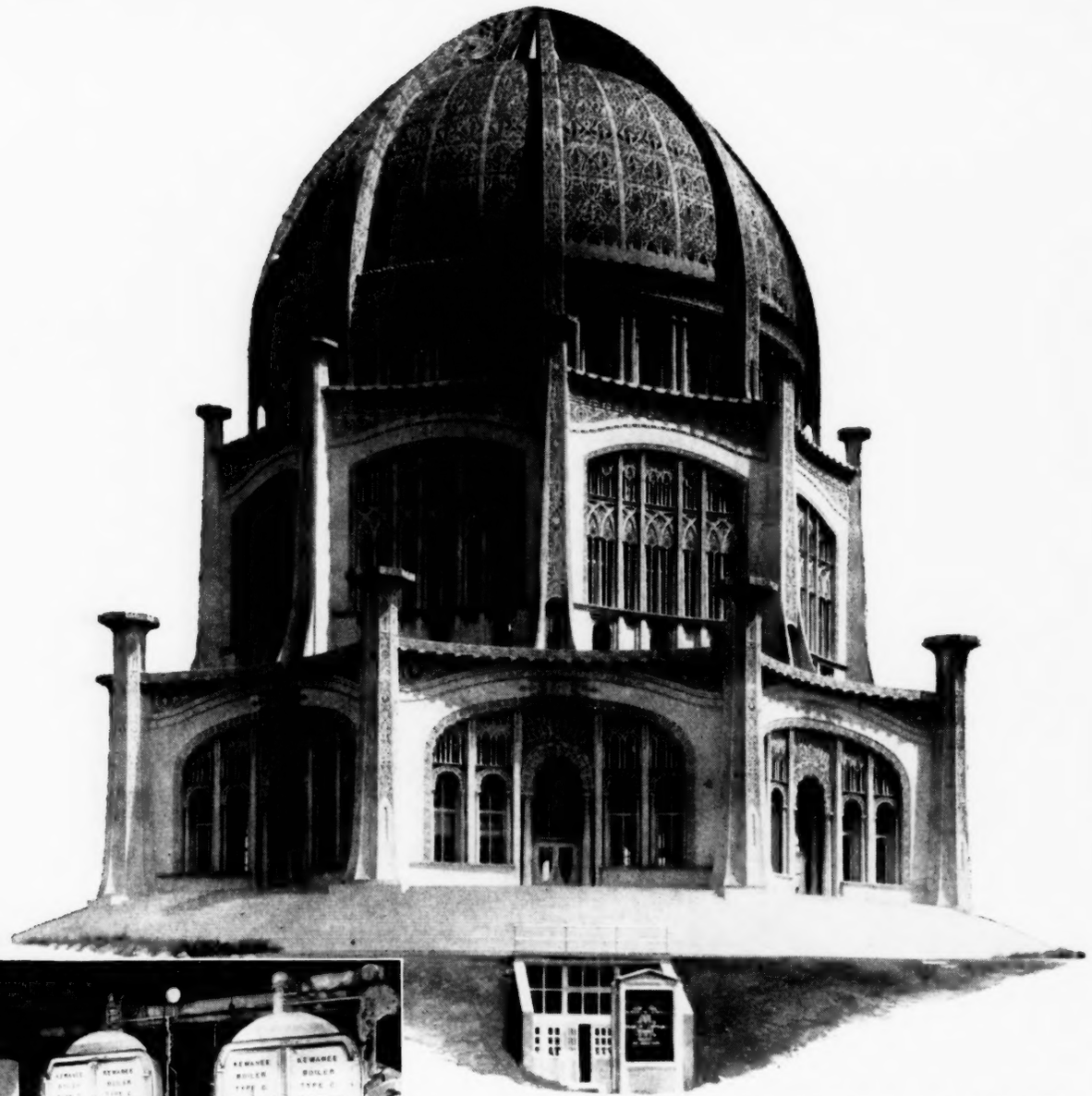
SARCO CANADA, LTD., TORONTO 5, ONTARIO



The BAHÁ'Í TEMPLE Wilmette Illinois

Nonagon in plan, tripartite in elevation, this architectural masterpiece blends the ancient mysticism of the Orient and of the Occident with the practicality of the present. It was laboriously molded block by block in gleaming white cement sparkled with fine-ground quartz.

Three tiers of nine capital-tipped pilasters support as many arched facades for the doorways inset below. All are richly fashioned in symbolic tracery. All converge triumphantly to a focal pivot-point, fit apex for the capping cupola, spheroid shaped and textured in frosted filigree.

In perspective a brilliant vista, this house of meditation is the visible nucleus of a cultural center to come, purposed as a social service grouping to exemplify in practice the unifying influence of Baha'i teachings.

Baha'i's boilers offer three-fold warmth in welded steel from a triad of

KEWANEE

Type "C" BOILERS

Steaming Capacity, 500 horsepower, fueled with oil

L. J. Bourgeois, Architect
Advance Heating and Air Conditioning Corp.

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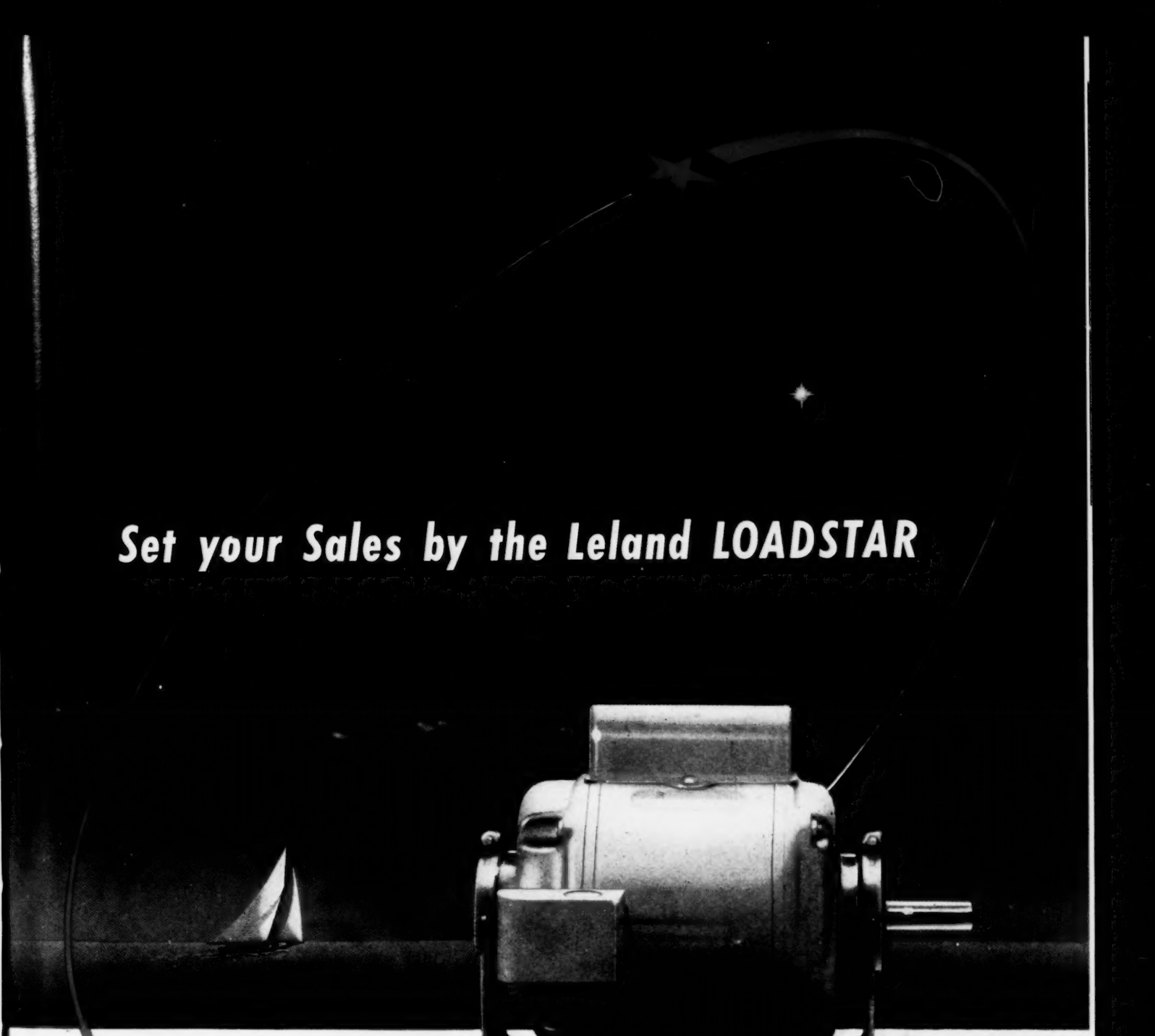
OVER 75 YEARS BOILERMAKERS

Set your Sales by the Leland LOADSTAR



Illustrated: *The Leland Loadstar Type KL Capacitor Start-Induction Run Motor*

COOL-RUNNING! *Internal fan air-cooling, and newly developed ventilation features.*

QUIET! *Exceptionally close tolerances eliminate vibration, prolong motor life. Engineered throughout for smooth, silent operation under most exacting conditions.*

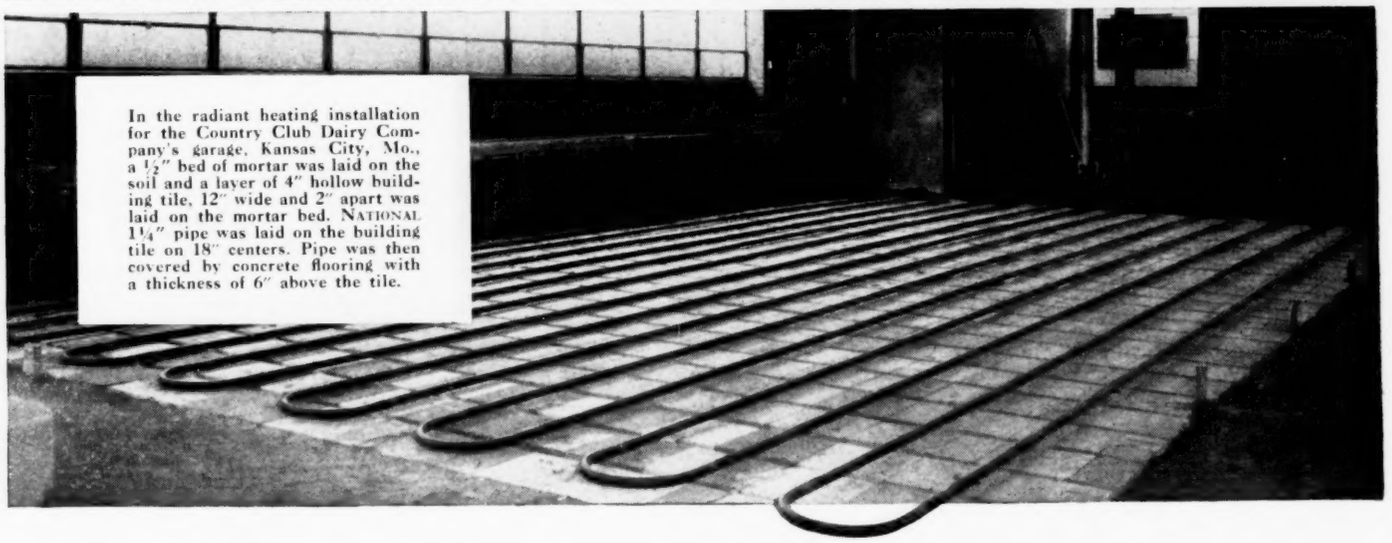
SELECTION! *1/6 to 3 HP. Types—ball bearing and sleeve bearing; open and enclosed; horizontal and vertical. Thermomatic control optional. Special-purpose motors built to specifications.*

LOADSTAR-POWERED, your product will encounter smoother sailing at the point of sale. However high your production and performance standards—you'll find the self-same qualities in Leland Loadstars. Thus, the Leland nameplate—on hushed, sweet-running, cooler motors—becomes an important factor in the service of your product and in the satisfaction it is built to render. Specify Leland Loadstars for HP per cubic inch as high as any —for HP per pound higher than most. *Write for complete descriptive folder.*

THE LELAND ELECTRIC COMPANY, DAYTON 1, OHIO. ***Branches in all principal cities.***

LELAND LOADSTAR MOTORS

MOTORS OF ALL TYPES—ENGINEERED TO INDUSTRY'S SPECIFIC NEEDS



In the radiant heating installation for the Country Club Dairy Company's garage, Kansas City, Mo., a ½" bed of mortar was laid on the soil and a layer of 4" hollow building tile, 12" wide and 2" apart was laid on the mortar bed. NATIONAL 1¼" pipe was laid on the building tile on 18" centers. Pipe was then covered by concrete flooring with a thickness of 6" above the tile.

Planning a radiant heating installation?

. . . make sure the pipe is NATIONAL

This 48-page book brings you an easy to understand story on radiant heating and gives you practical information as a basis for planning and installing an efficient pipe system. It will answer many questions about radiant heating that you may have. For your free copy address: National Tube Company, Frick Building, Pittsburgh, Pa.

COLD floors, so detrimental to garage personnel, have been successfully eliminated in this Missouri dairy garage by radiant heating. It has also eliminated hot and cold temperature zones . . . minimized the chilling caused by door openings . . . provided a larger working area.

Steel pipe is ideal for radiant heating installations just as it is ideal for other hot water or steam heating systems. It expands at the same rate as concrete and plaster; it is easy to weld, easy to bend, and, with its maximum of advantages, costs less.

NATIONAL, the leader in steel pipe for many years, offers the additional advantages of the Scale Free and Spellerizing Processes. These processes mean that the pipe interior is clean, smooth, free from mill scale, with minimum frictional resistance. They also mean superior corrosion resistance, and increased weld strength through extra rolling.

For detailed information on the use of NATIONAL Pipe in radiant heating installations, write for Bulletin — "Radiant Heating with NATIONAL Pipe." Address National Tube Company, Frick Building, Pittsburgh, Pennsylvania.

NATIONAL TUBE COMPANY ★ USS STEEL ★ UNITED STATES STEEL

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

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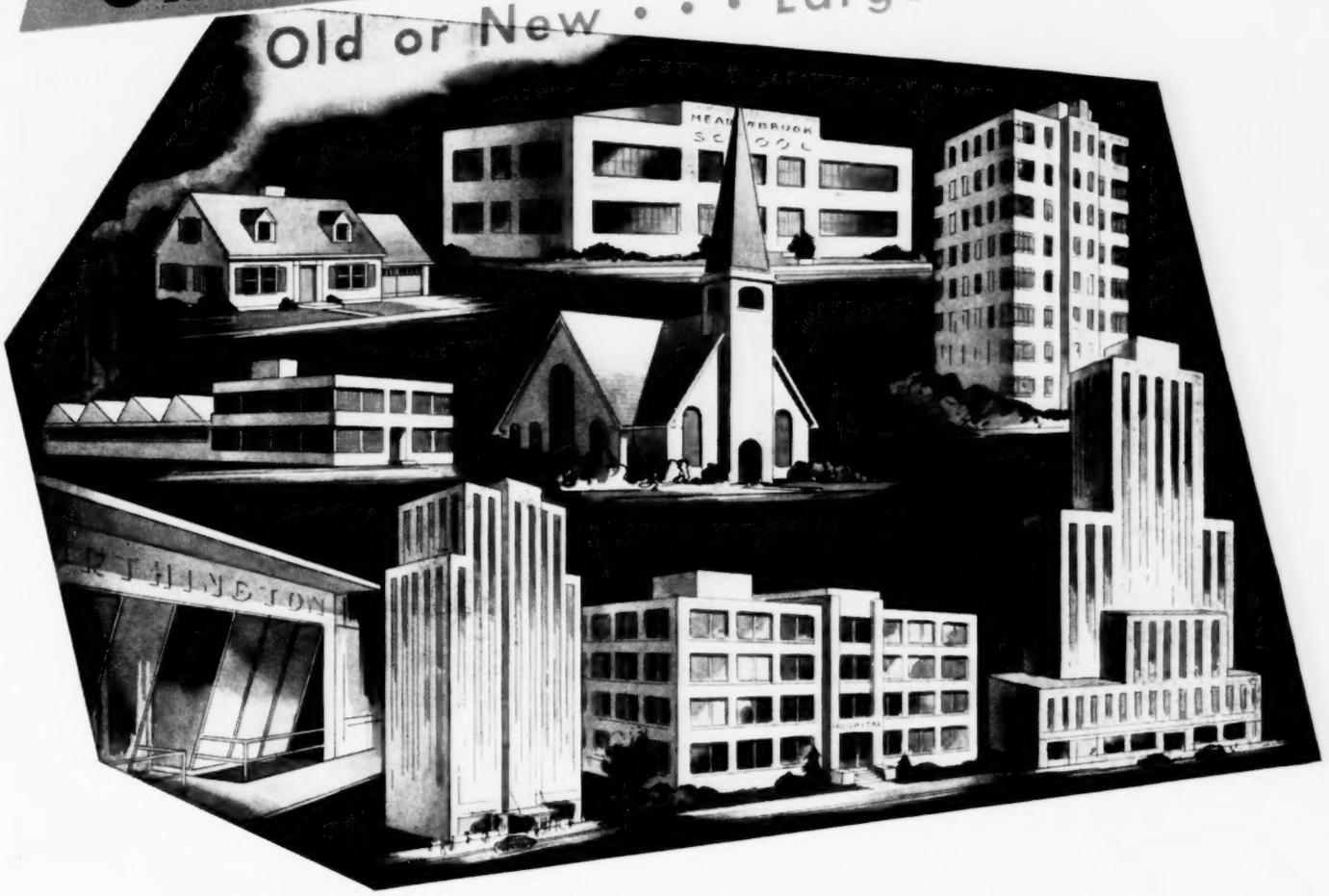
UNITED STATES STEEL

Automatic Controls

FOR EVERY HEATING . . . . OR AIR CONDITIONING JOB

Old or New . . . Large or Small!



NO matter what your concern—from a huge ultra modern building demanding the last word in air conditioned comfort, to a small existing structure where the replacement of out-dated controls brings more economical efficient heating—there are Honeywell automatic controls to meet your needs.

That's because only Honeywell offers a complete line of controls, electric and pneumatic, for every heating, ventilating and air conditioning requirement, and when you standardize on Honeywell, you gain a distinct advantage in more than one way. First, full responsibility is centered at one single source. Honeywell is accustomed to accepting this responsibility, and Honeywell alone is in a position to make unbiased recommendations about the control system best suited to the job.

Always supporting this feature of single responsibility is the 60-year Honeywell reputation for dependability. During all these years, Honeywell has maintained its position of leadership, both in developing new improvements and in setting the standards by which performace is judged. Minneapolis-Honeywell Regulator Company, Minneapolis 8, Minnesota. In Canada: Toronto 12, Ontario.

MINNEAPOLIS **Honeywell**

CONTROL SYSTEMS

73 BRANCHES FROM COAST TO COAST WITH SUBSIDIARY COMPANIES IN: TORONTO • LONDON • STOCKHOLM • AMSTERDAM • BRUSSELS • ZURICH • MEXICO CITY

HARTZELL
Lo-Noise Fan

an extremely QUIET high-efficiency fan

If you have wished for a really efficient slow-speed *quiet* fan for those locations where you *must* have air but *can't* have noise—*here it is!* Not an adaptation, not an experiment—a genuine new Hartzell fan developed to meet *one* need—a lot of air at a minimum of power cost and a whisper of noise.

True airfoil cast aluminum alloy blades, designed, tested and proved in the Hartzell laboratories—*not* metal stampings. The famous exclusive Hartzell curved orifice Air-Seal Ring which prevents backflow of air at propeller tips. Totally enclosed ball-bearing motors conservatively rated for continuous duty. Oversize ball-bearing shaft. Long-lived V-belt drive.

You'll *like* this fan, year after year after year.

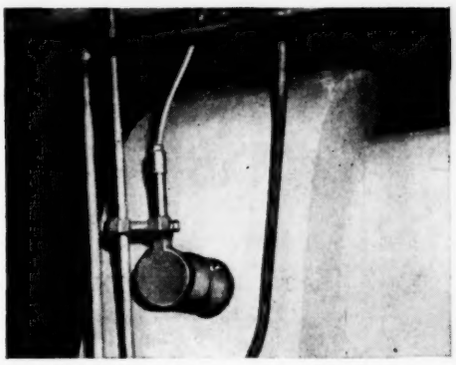
Bulletin 2001 gives Certified Air Deliveries, sizes, mechanical details and other information. Write for it. It's free.

HARTZELL
PROPELLER FAN CO.
PIQUA DIVISION OF CASTLE HILLS CORPORATION **OHIO**

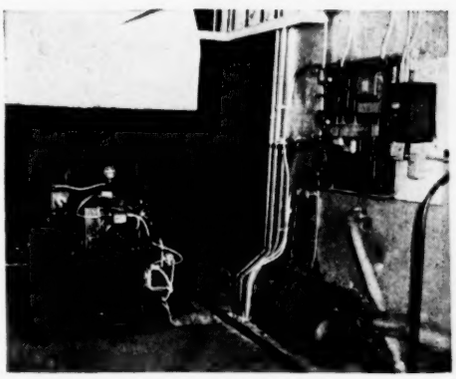
PROPELLER-TYPE FANS AND BLOWERS • ROOF VENTILATORS • UNIT HEATERS • ENGINEERING OFFICES IN PRINCIPAL CITIES

Robot-Eye SAVES 10 TO 20% OF FUEL OIL

IN APARTMENTS IN FACTORIES IN INSTITUTIONS



THIS IS THE EYE that measures the density of the gases and, when necessary, automatically adjusts secondary air door—(modulated control).



A panel on the wall indicates combustion conditions at all times.

Everybody wants to save fuel oil, and lots of people are doing something about it with Robot-Eye. This is the simple electronic eye which observes combustion gases, and controls the fuel-air ratio by operating the auxiliary air door motor when necessary.

Robot-Eye is a complete combustion control, no auxiliary instruments or accessories needed. It saves 10 to 20% of the fuel oil used on horizontal rotary cup burners burning No. 5 or No. 6 oil.

Any good burner will operate efficiently under fixed conditions. But conditions vary. Wind, barometer, fuel oil temperatures and viscosity are constantly varying. And engineers are human, with only two eyes and two legs, and lots of other things to do. Robot-Eye is the vernier control that extracts all possible heat without causing smoke.

Leading fuel oil and oil burner experts have accepted these facts as a result of nine years service records and experience with the Robot-Eye on all types of rotary cup burners. Testimonial letters, test records, complete data available. Better yet, let our engineers tell you what Robot-Eye will save on any specific job.

GENERAL POWER PLANT CORPORATION

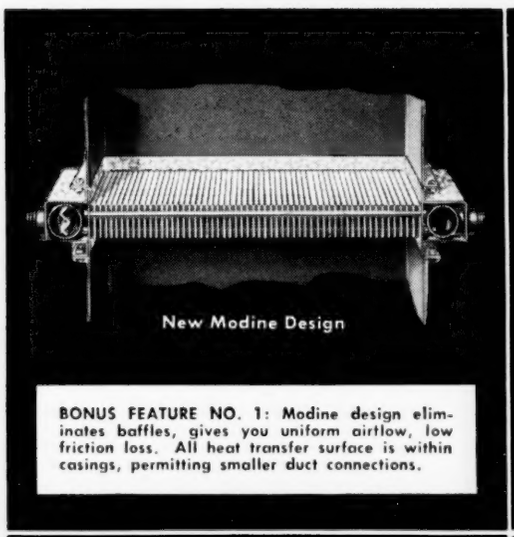
381 FOURTH AVENUE
NEW YORK 16, N. Y.

MANUFACTURERS OF—

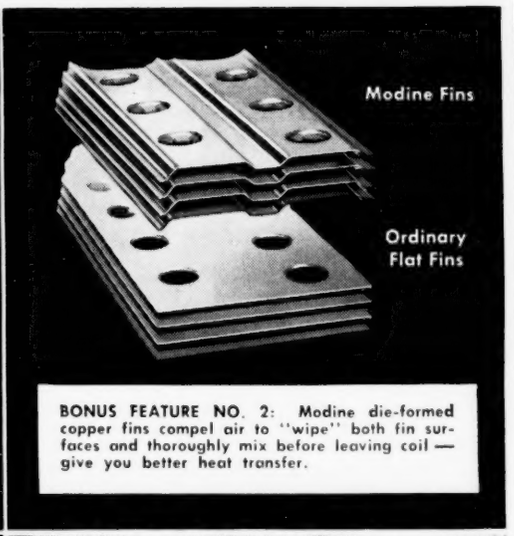
Robot-Eye

AUTOMATIC ELECTRONIC COMBUSTION CONTROL

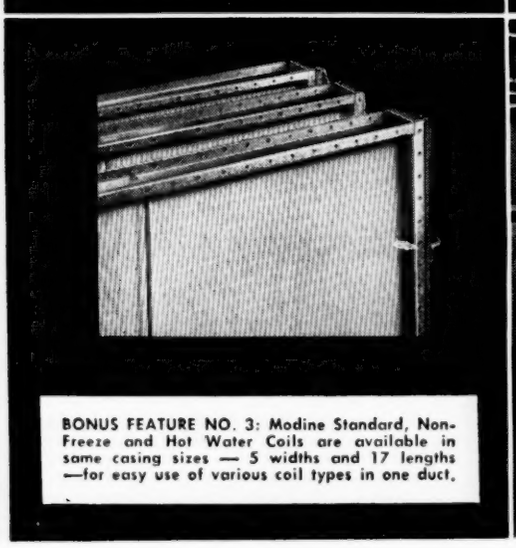
YOU GET SPECIAL BONUS FEATURES IN MODINE COILS!



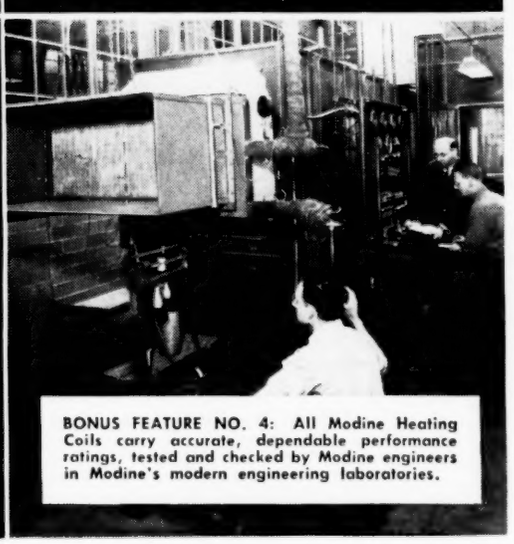
BONUS FEATURE NO. 1: Modine design eliminates baffles, gives you uniform airflow, low friction loss. All heat transfer surface is within casings, permitting smaller duct connections.



BONUS FEATURE NO. 2: Modine die-formed copper fins compel air to "wipe" both fin surfaces and thoroughly mix before leaving coil — give you better heat transfer.



BONUS FEATURE NO. 3: Modine Standard, Non-Freeze and Hot Water Coils are available in same casing sizes — 5 widths and 17 lengths —for easy use of various coil types in one duct.



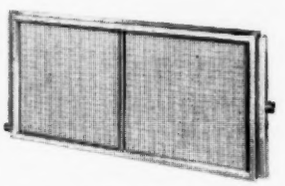
BONUS FEATURE NO. 4: All Modine Heating Coils carry accurate, dependable performance ratings, tested and checked by Modine engineers in Modine's modern engineering laboratories.

Specify Modine for the Newest and Finest in Heating Coils!

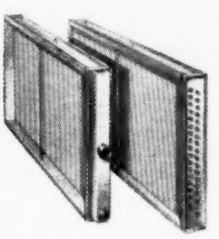
New design improvements, better performance, greater structural strength, easier installation — these are just a few of the quality features which Modine has built into its new line of Heating Coils. Specially designed to match your specific performance and size requirements for heat transfer surface, Modine now offers you a COMPLETE line of coils for a wide range of applications. It will pay you to get all the facts about this new line of coils. Write on your letterhead for new 48-page catalog No. 348, or call the Modine Representative listed in the "Where-to-Buy-it" section of your phone book. MODINE MANUFACTURING CO., 1511 DEKOVEN AVENUE, RACINE, WISCONSIN.

Modine HEATING COILS

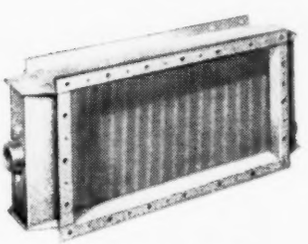
Four Types, 1236 coils to choose from!



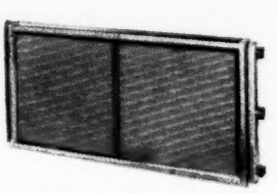
STANDARD COILS
595 individual coils



NON-FREEZE COILS
510 sizes and models



BOOSTER COILS
46 different sizes



HOT WATER COILS
85 individual coils

FREE! NEW COIL CATALOG

Order Modine's complete new 48-page handbook on heating coils for your technical library! Contains complete data on sizes, performance, selection and installation.

"Sure, I spent the money on a new hat instead of telling the plumber to put on a relief valve, so what?"

"MANY A TRUTH IS SPOKEN IN JEST" . . . .

Yes, your real competitor tomorrow may be the local milliner! Here's the point:—

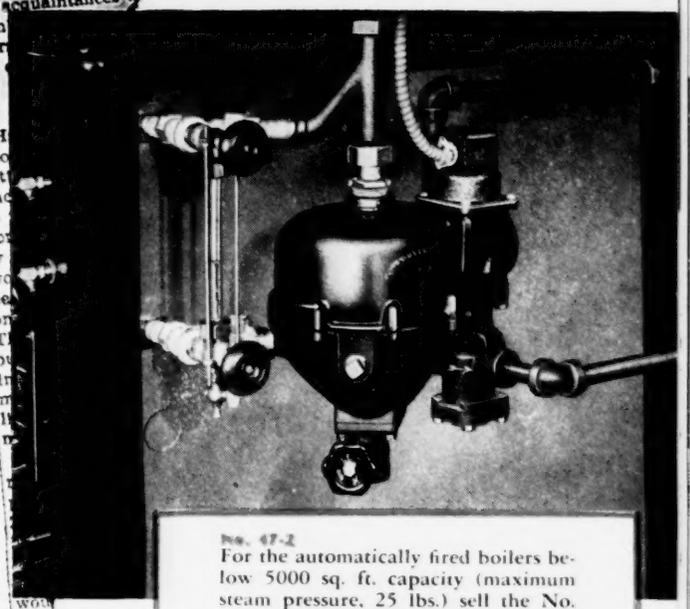
According to the most conservative estimates, the productive capacity of industry is now *twice* as great as it was in the pre-war year of 1939. . . . and this, remember, is in terms of actual goods being produced; not inflated dollar value.

This is a mighty significant fact. It means that as soon as the backlog of pressing needs is satisfied there will be the wildest scramble for John Q. Public's dollar this country has ever seen. Don't ask us when this will come, but when it does come you will find that your *real* competitor won't be other heating men like yourself. Your real competitors—the fellows to fear—will be the high pressure boys in the automobile sales room, the radio store, the furniture shop and a raft of other Eager Beavers competing for John Public's always insufficient dollars.

A lot of keen observers have said that in former competitive times the plumbing and heating industry has placidly stood back and taken a good trimming from these hard-hitting merchandisers in other fields. If this is so (and who can deny it?) then isn't it just about time to start the fight for your fair share of that dollar?

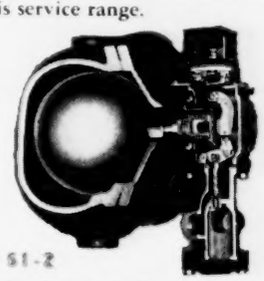
The real heat from other fields isn't quite on John Public yet. The orders for autos and other consumer goods are still easy to get and production hasn't yet caught up. So now is the time to surmount all handicaps and grab onto the glorious opportunity to give John and his wife equipment that is far more important to them than convertibles and mink coats!

Our own good example of something they need, is the devices that protect their boiler investment—McDonnell Boiler Water Feeders and Low Water Cut-Offs. Your jobber can now supply you with this equipment that should be on every steam boiler and many hot water boilers. Equipment like this can help you meet tomorrow's competition by beating it today. Ask for latest information, prices and sales helps.



No. 47-2

For the automatically fired boilers below 5000 sq. ft. capacity (maximum steam pressure, 25 lbs.) sell the No. 47-2 feeder—cut-off combination—the device that makes the boiler water level as automatic as the firing. The No. 47 (without low water cut-off switch) takes care of hand fired jobs in this service range.



No. 51-2

For the larger boilers, above 5000 sq. ft. capacity (maximum steam pressure, 35 lbs.) sell the No. 51-2 for automatically fired jobs or the No. 51 for the hand-fired boilers.

No. 67

If they are not willing to go all the way by using the No. 47-2 or No. 51-2, sell them the McDonnell No. 67 Low-Water Cut-off (maximum steam pressure, 25 lbs.)—the most widely used, thoroughly proved cut-offs made!

No. 150

For the high pressure boilers (up to 150 lbs.) the No. 150 has opened up a vast and profitable market. You can use it as a low water cut-off, low water alarm, feed-pump control, or for any combination of these services. Ask for installation manual.

McDONNELL & MILLER, INC. 1313 Wrigley Bldg., Chicago 11, Ill.

Your Jobber Sells Them

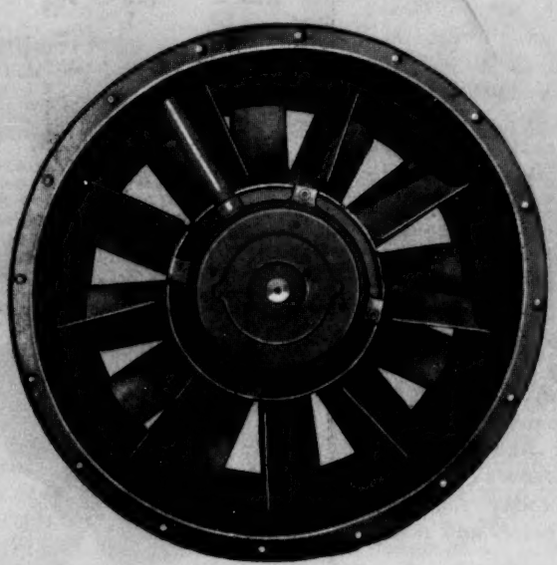
Doing One Thing Well

McDONNELL *Boiler Water Level Controls*

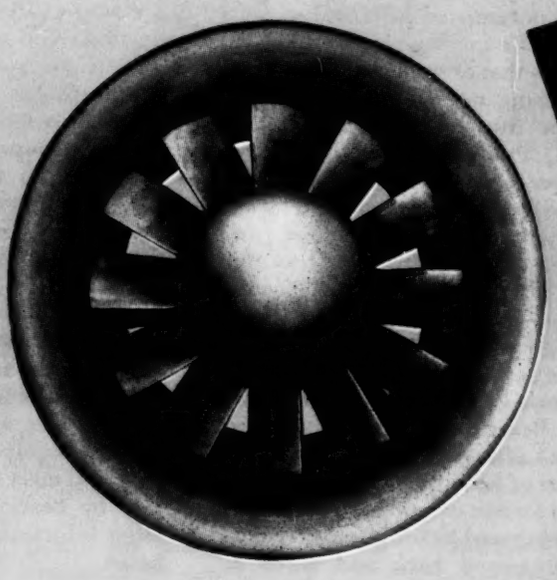
The greatest advance in Fan Engineering in a decade!

JOY "SERIES 1000" *AXIVANE FANS*

Utilizing the Vaneaxial principle— permitting high efficiences, low installation costs and many other outstanding advantages to the user.



Rear view, showing vanes and motor.



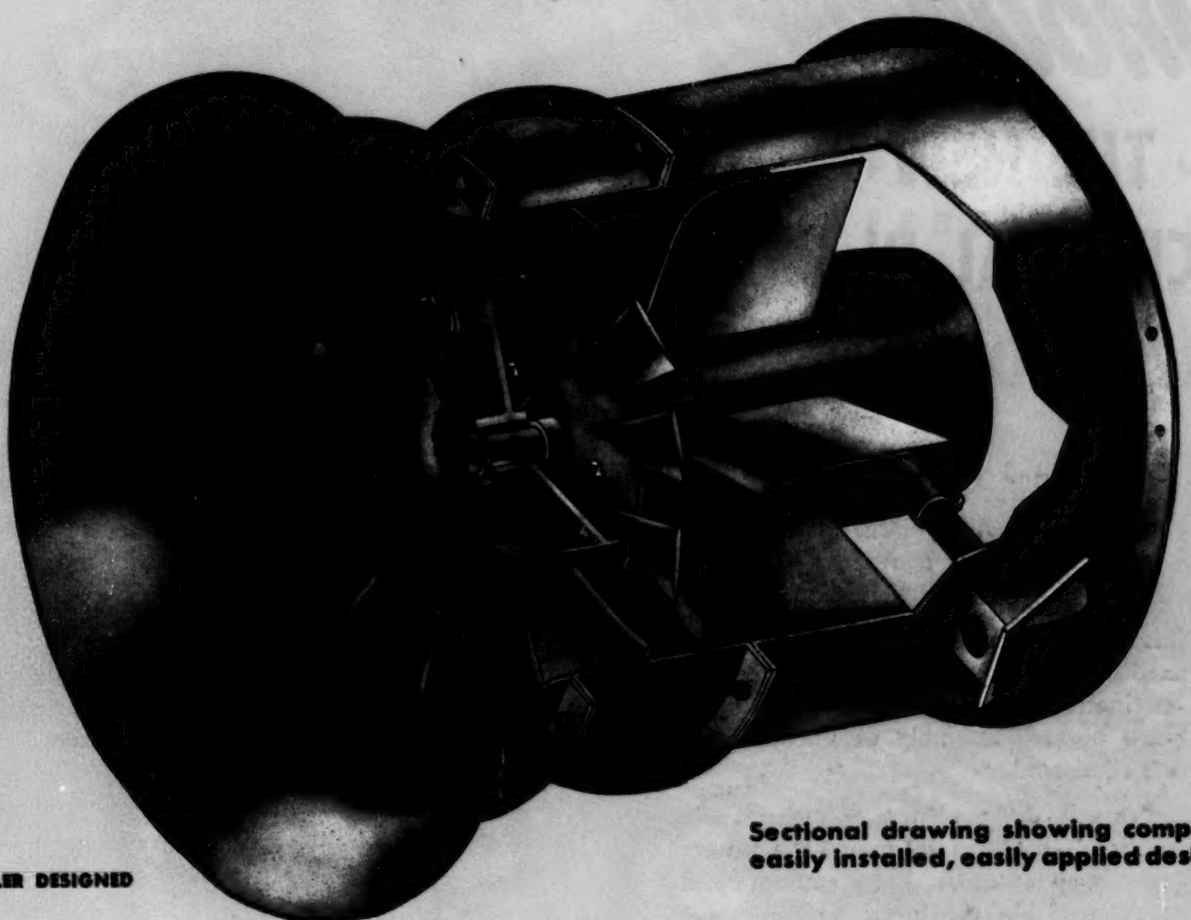
Front view, showing simplicity of construction.

Call for a Joy Engineer

JOY FANS

Joy Axivane Fans offer exclusively the obvious advantages of "on-the-job" blade adjustment –

Adjustable Blades, insures maximum performance efficiency and flexibility. Blades are adjustable on-the-job by loosening just one lock nut, enabling correction of duct resistance and providing wide pressure ranges.



TROLLER DESIGNED

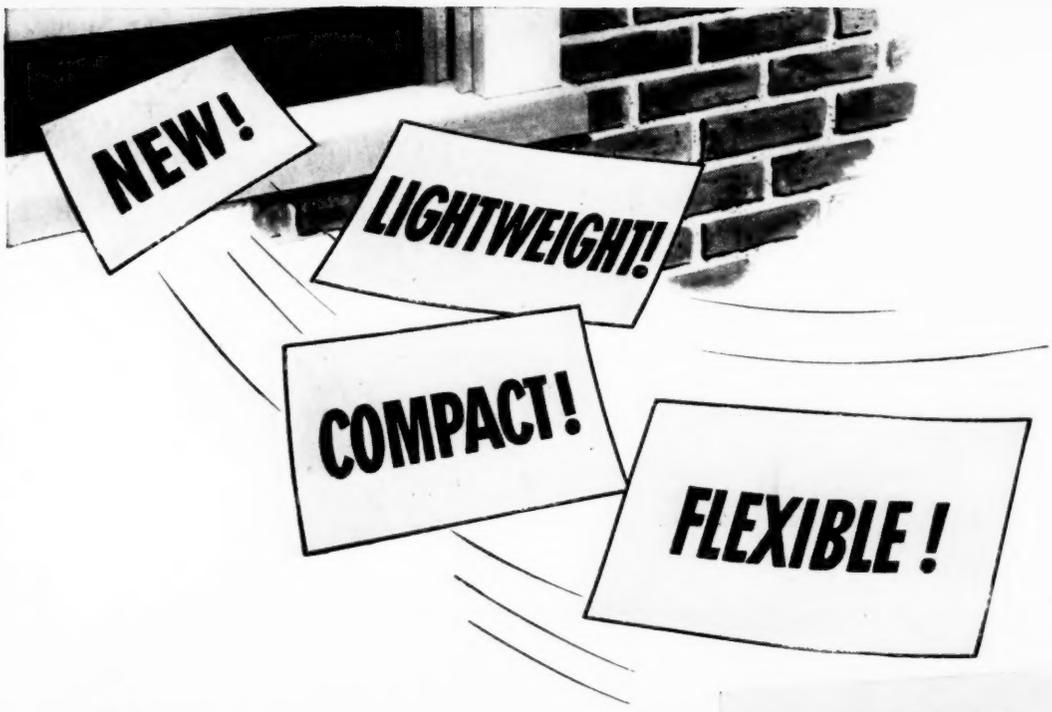
Sectional drawing showing compact, easily installed, easily applied design.

Write for descriptive Bulletin illustrating various general industrial applications. Now ready!

WSD 1-1457

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.



Announcing!

THE NEW GE CENTRAL PLANT AIR CONDITIONER

HERE'S Better Air Conditioning for your clients in a single convenient package—the G-E Central Plant Air Conditioner.

This General Electric unit is planned and integrated *as a single unit*...with all components pre-engineered, pre-fabricated, pre-matched. "Jig-saw puzzle" assembly of uncoordinated parts is eliminated.

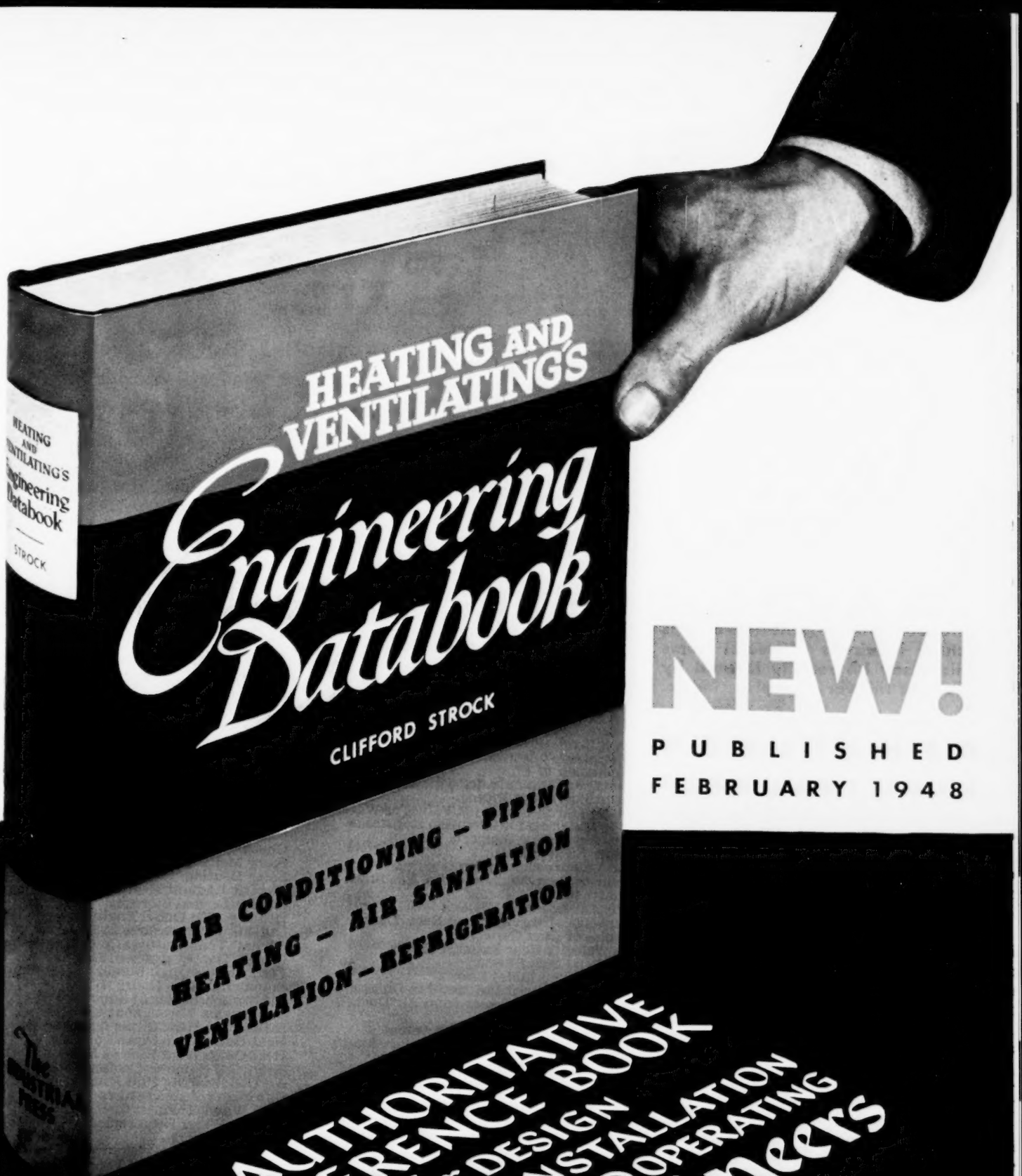
The smartly designed new unit shares with the regular G-E horizontal model the features of attractive appearance...quiet, smooth operation...dependable, consistent performance. It is extremely flexible and can be assembled in 12 different combinations to meet any space requirements. Coil connections can be made at either side.

These units have been designed specifically to make inspection and maintenance extremely easy. Your local General Electric Air Conditioning expert will be glad to work with you in planning the installation of these G-E Central Plant Air Conditioners.

General Electric Company, Air Conditioning Department, Section A8914, Bloomfield, N. J.

GENERAL ELECTRIC

Better Air Conditioning



NEW!

PUBLISHED
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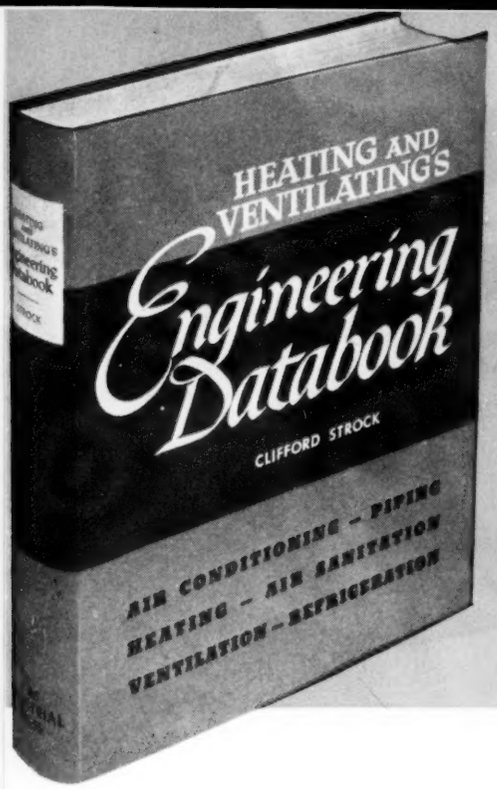
AN AUTHORITATIVE REFERENCE BOOK for DESIGN INSTALLATION AND OPERATING Engineers

FOR DETAILS SEE NEXT THREE PAGES



HEATING AND VENTILATING'S Engineering Databook

This list of 175 subjects indicates the great scope of the Engineering Databook. These general subjects include hundreds of useful items which may be readily located by means of the very complete index.

A Complete Picture of the Contents

Principles of Psychrometry
Properties of Dry Air
Miscellaneous Properties of Water
Thermal Properties of Water
Psychrometric Tables and their Use
Relative Humidity Tables
Dewpoint Tables
Vapor Pressure Tables
Effective Temperature Tables
Absolute Humidity Tables
Psychrometric Charts and their Use
Comfort Air Conditioning Charts
Dewpoint Temperature Chart
Humidity Chart
Altitude Density Chart for Air
Theory of Combustion
Combustion Temperatures; Efficiency of
Air Required for Perfect Combustion
Flue Gas with Perfect Combustion
Heat Lost in Flue Gas
How to Analyze Flue Gases
Dew Point of Flue Gases
Combustion Data for Typical Fuels
What the Flue Gas Analysis Means
Classification and Properties of Coals
Ultimate and Proximate Analysis of Coal
Heating Value of Coals
Sizes of Coal and Coke
Storage Space for Solid Fuels
Combustion Efficiency — Bituminous Coal
Combustion Efficiency — Anthracite
Overfire Jets for Smoke Reduction
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Fuel Oil Weight and Volume Equivalents
Storage Space for Liquid Fuels
Contents of Cylindrical Tanks
Contents of Partially Filled Tanks
Combustion Efficiency — Oil
Gas Fuels, Class. and Properties
Combustion Efficiency — Gas
Determining Equivalents of Fuels
Comparison of Fuel Costs
Chimney Sizing
Chimney Construction
Fundamentals of Fluid Flow
Viscosity of Liquids
Definition of Pipe Fittings
Pipe Threading
American Standard Taper Pipe Threads
Data on Iron and Steel Pipe
Data on Copper Tubing
Carrying Capacity of Pipe and Tubing
Estimating Friction in Cold Water Piping
Cold Water Friction Charts
Estimating Friction in Hot Water Piping
Hot Water Friction Charts
Sizing Steam Piping
Pressure Drop in Steam Pipe Lines
Velocity of Steam in Pipes
Sizing Pipe for Steam, Gases, Vapors
Steam Losses from Piping
Pipe Insulation
Insulation to Prevent Sweating on Pipes
Expansion of Pipe
American Standard for Pipe Fittings
Identification of Piping
Water Hardness and pH Values of Water
Pipe Materials for Corrosion Resistance
Spacing of Pipe Supports
Centrifugal Pumps
Air Velocity Conversion
Velocity Equivalents of Gage Readings
Charts for Duct Sizing
Friction Losses in Elbows
Capacity of Circular and Rect. Ducts
Tables of Duct Capacities
Air Velocity Near Exhaust Hoods
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Non-Ferrous Metal Sheets
Estimating Weight of Metal in Ducts
Heat Gains and Losses from Air Ducts
Fans and Blowers
Standard Fan Drive Arrangement
Max. Concentration of Air Contaminants
Potential Industrial Health Hazards
Code for Attic Ventilation
Characteristics of Air Cleaning Methods
Compressed Air Flow Charts
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Compression of Air
Power to Compress Air
Thermometric Scales and Conversion
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Heat Transfer by Radiation
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Heat Wasted by High Inside Temperatures
Checklist for Heating System Servicing
Checklist for Fuel Conservation
Snow Melting
Solar Heating
Electric Radiant Heating
Electrothermal Storage
Heating with Diesel Engines
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Heat Gains from Pipes and Ducts
Heat Gains from Human Beings
Short Cut Summer Cooling Estimates
Air Conditioning Unit Estimating
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Well Water Temperatures
Cooling Water Requirements
Cooling Towers
Refrigeration Heat Quantities
Rate of Circulation of Freon-12
Refrigeration Compressor Capacity
Heat Added by Refrigeration Compressors
Properties of Refrigerants
Sizing Refrigerant Piping for Air Cond.
Air Conditioning Maintenance Schedule
The Heat Pump
Motor Selection
Motor Terms
Motor Standards
Standard Motor Dimensions
Checklist for Motor Troubles
Selection of V-Belts
Law of Contracts — Essential Facts
Logarithms — Application and Tables
Circumferences and Areas of Circles
Standard Drafting Room Practice
Standard Abbreviations
Mathematical Signs and Symbols
Commonly Used Constants
Drafting Room Symbols
Checklist for Air Conditioning Drawings
Conversion Factors
Terminology

A NEW Reference Book

for: Heating Engineers · Estimators · Air Conditioning Engineers · Ventilating Engineers Architects · Piping Engineers · Contractors Plant Engineers · Operating and Maintenance Engineers · Engineering Students.

576 Pages — 317 Essential

Tables, 193 Charts and Illustrations. The 8½" x 11" page size provides space for large-scale, easy-to-read charts, which eliminate or greatly simplify your calculations.

The Scope of the Engineering Databook

Heating and Ventilating's New Engineering Databook is an authoritative reference book providing working data on heating, ventilating and air conditioning for design, installation and operating engineers. Its time-saving tables and large-scale charts greatly simplify everyday estimating and design problems. The table of 175 subjects shown on the opposite page indicates the great variety of practical information you will find in the Engineering Databook. These subjects are grouped under the following eleven main divisions, which briefly illustrate the range covered by this valuable reference work.

1. Heat and Moisture in Air
2. Fuels and Combustion
3. Piping — Sizing, Standards, etc.
4. Air Handling and Ventilation
5. Heating and Heat Transmission
6. Cooling and Air Conditioning
7. Motors — V-Belt Drives
8. What the Contractor Should Know About Contracts
9. Mathematical Tables
10. Drafting Room Standards
11. Terminology of the Industry

Important Data on Recent Developments

The Engineering Databook is filled with fundamental information, but its overall scope is considerably more than the covering of commonly used data. In addition, the latest information is presented on the important subjects shown in the following list:

The Heat Pump — Use of a refrigerating machine for both heating and cooling a building.

Electrothermal Storage — Drawing the electric energy from the lines during the night and other off-peak hours, and storing the energy as heat in water tanks, to be drawn on as needed.

Snow Melting — Circulation of hot water containing antifreeze through coils embedded under sidewalks, steps, porches, driveways, etc., for automatic snow removal.

Heating with Diesel Engines — Heating buildings by the use of heat otherwise wasted in the jacket cooling water and the exhaust of diesel engines.

Attic Ventilation—Pointers on proper design and installation of attic fans for cooling residences.

Heating Water by the Sun — Data and drawings showing how use can be made of solar heat for heating domestic hot water.

Radiant (Panel) Heating — Data on radiant heating by use of buried electric cables, or buried coils containing hot water, making the heating equipment in the room invisible.

Basementless Buildings—Authenti data on the calculation of heat losse through concrete slabs on the groun and through floors over a crawl spac

Axial Flow Fans — A thoroughgoin discussion on the advantages and dis advantages of axial flow fans as com pared with centrifugal fans.

Estimating for Air Conditionin Units — Latest short-cut methods fo determining the size of unit air con ditioners for cooling offices, stores an residences.

Toxicity — Latest complete and offi cial data on M.A.C. (maximum allow able concentration) of fumes, gase and dust, for determining ventilatio quantities.

What You Should Know About The Law of Contracts

A most useful and unusual feature o the Engineering Databook is the 18 page section devoted to the law o contracts. This section is based o actual high court decisions which ap ply specifically to heating, ventilatin and air conditioning cases. In thi section are discussed: the validity c contracts, implied warranty, technica competence, alteration of plans, ex tras, subcontracting, substitutions, in conspicuous clauses, guarantees, dis tinction between employee and con tractor, and many other points cov ered in the law of contracts. Eac case used as an example is one i which a heating, ventilating or ai conditioning contractor or enginee was involved. In addition, other lega subjects which concern heating me are discussed, such as: patent in fringement, real estate law, rela tions with municipalities, mechanic' liens, withdrawals of bids, and "cos plus" contracts.

Postpaid in U. S. **$7.00** **Order Form on Next Page**

For Canadian or Foreign orders, please add 80c postage.

How Many of the Questions on the Next Page Can You Answer?

Do You Know the Answers?

The sample questions below indicate the comprehensive down to earth character of HEATING AND VENTILATING'S ENGINEERING DATABOOK. You will find the answers to hundreds of questions like these in the DATABOOK.

Is a "splitter" in a duct elbow of greater advantage with large curve ratios or small curve ratios?

What is the difference between total heat, enthalpy and sigma function of air?

What trouble would you look for with an a.c. motor which runs and then dies down?

The speed of a pump is increased 25% to increase its capacity 25%. Would the increase in horsepower required be of the order of 25%, 50%, 100% or 200%?

Is there a worthwhile saving in insulating the edge of a concrete floor slab in a basementless home?

What air velocities are recommended through the ceiling grille in an attic fan installation?

An exhaust hood is to carry a dangerous fume from a machine operated by a worker 36 inches away. If the air velocity is too low, the fumes will be breathed by the workman, if too high, power costs will be excessive. Can the air velocity 36 inches from the hood be simply calculated?

In general, which has the better adaptability to an installation with a fluctuating system characteristic — an axial flow fan or a centrifugal fan?

If the owner modifies your plans and specifications for a heating system, are you liable for errors?

What is the difference between motors of the following types — varying speed motor, adjustable speed motor, adjustable varying speed motor?

In an Orsat analysis, what would the presence of carbon monoxide with free oxygen indicate?

When would you locate a relief valve on a hot water supply system if it is (a) of the pressure type, (b) of the pressure-temperature type?

Which roof covering would result in the larger load on the air conditioning system from solar heat — one of red asphalt shingles or a red clay tile roof?

How would chemical drying of air be plotted on a psychrometric chart?

What is the objection to a spray pond for cooling water for a refrigeration system?

In a cost-plus contract can the contractor charge for depreciation of equipment?

The dew point of a flue gas is not the temperature at which the water vapor condenses out. What is it?

What range of air velocity should be used in an exhaust system for foundry dust?

What is the purpose of the capacitor in a capacitor motor?

If a contractor manufactures a patented device for his own use is he liable for infringement?

What is the difference between perfect combustion and complete combustion?

Three radiators in the same system are identical except that one is painted with gold bronze, one with white paint, one with brown paint. Which will have the highest heat emission?

What is a simple formula for determining the seasonal fuel oil requirements for a heating plant?

Which pipe most needs insulating because of heat loss — a 3 inch pipe carrying steam at 300 lb. pressure or a 1¼ inch pipe with 150 deg. superheated steam at 200 lb. pressure?

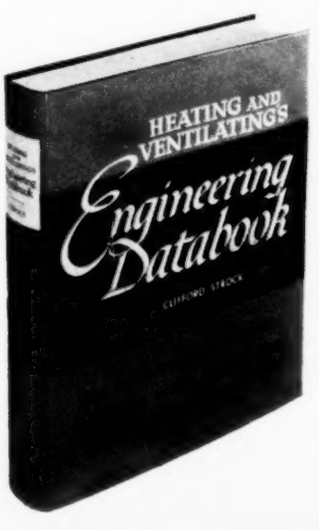
How would you determine the number of hours an oil burner would operate in an average heating season in your city?

In combustion, how is the per-cent of excess air determined?

Place your order now for this authoritative reference book. Use the coupon below with Refund Offer.

THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N. Y.

I enclose check, postal note or money order for $____, including 80c Canadian or foreign postage if necessary. Please send me a copy of HEATING AND VENTILATING'S New ENGINEERING DATABOOK. I have the right to return the book within 5 days and money will be refunded.



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Firm* _____ **Position*** _____

*This information would be appreciated for our private records.

4/48

Heat, Ventilate and Air-Condition with...

MULTI-VENT

The Only Air Diffusion System You Can't Feel Can't Hear Can't See

O'Connell's Restaurant, Michigan Boulevard, Chicago.
Multi-Vent Panels completely concealed by metal acoustical ceiling

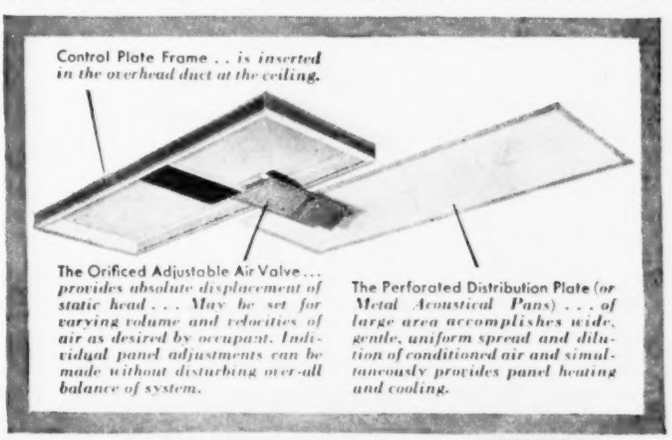
MULTI-VENT is the only air diffusion system you can't feel because *only* Multi-Vent's exclusively patented total displacement valve and large perforated distribution plate can provide the very low velocity and widespread air delivery necessary to completely eliminate drafts and the subtle, annoying sensations of draft, i. e. uneven room temperatures.

MULTI-VENT is an air diffusion system you can't hear, because Multi-Vent's recommended duct velocities and air volume requirements are so low that no audible friction noise is generated by the entering air. In addition, the sound absorption qualities of the perforated distribution plates actually reduces the noise level in any room.

MULTI-VENT is the only air diffusion system you can't see, because only Multi-Vent can be completely concealed above the square perforated pans in a *metal* acoustical ceiling. Multi-Vent panels can also be lined up with the creases in *fiber* acoustical ceilings for almost complete concealment. In all other types of installation, with exposed or concealed ducts, Multi-Vent panels are less conspicuous than diffusers of any other make.

MULTI-VENT, moreover, is by far the most *effective* and *efficient* air diffuser on the market today! Accurate tests show that Multi-Vent's low velocity air delivery makes possible the use of much higher diffusion temperature differences without affecting the room occupants' comfort. This in turn greatly reduces the air volume usually required to take care of a given load . . . thereby not only making possible substantial reductions in the tonnage of the basic air conditioning equipment, but also adding greatly to the comfort factor. The result is truly superb comfort. *No drafts . . . no sound of rushing air . . . no protruding ventilating fixtures.* Write for Bulletin for complete information and specifications.

SIMPLE TO INSTALL • QUICK TO BALANCE • EASY TO CLEAN


Control Plate Frame . . is inserted in the overhead duct at the ceiling.
The Orificed Adjustable Air Valve . . . provides absolute displacement of static head . . . May be set for varying volume and velocities of air as desired by occupant. Individual panel adjustments can be made without disturbing over-all balance of system.
The Perforated Distribution Plate (or Metal Acoustical Pans) . . . of large area accomplishes wide, gentle, uniform spread and dilution of conditioned air and simultaneously provides panel heating and cooling.

THE PYLE-NATIONAL COMPANY

MULTI-VENT DIVISION—1374 WEST 37th STREET, CHICAGO 9, ILLINOIS

Offices: New York • Philadelphia • Baltimore • Washington, D. C. • Cleveland • Cincinnati • Columbus, Ohio • Detroit • St. Louis
Kansas City • Omaha • Minneapolis • Denver • Salt Lake City • San Francisco • Greensboro, N. C. • Grand Rapids, Mich. • Winter Park, Fla.
Canadian Agent: F. W. Chambers and Co., Ltd., West Toronto 5

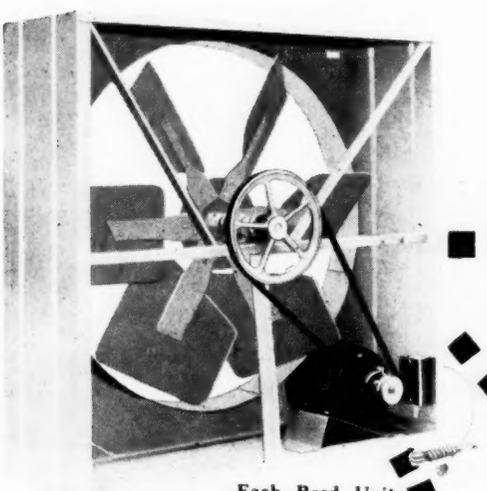
SINCE 1897

CONDUIT FITTINGS • PLUGS and RECEPTACLES • TURBO-GENERATORS • LOCOMOTIVE HEADLIGHTS • FLOODLIGHTS

SIMPLIFY YOUR SALES . . . MULTIPLY YOUR PROFITS!

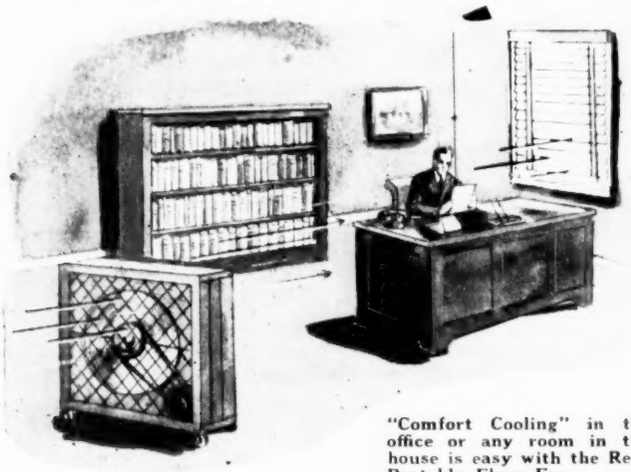
Reed Unit-Fans offer you the opportunity for "comfortable" profits on increased sales, with "comfortably" low inventory costs. With the addition of simple attachments to the basic Reed Unit-Fan — you can display window fans, attic fans, portable floor fans or commercial exhaust jobs. A dealer has only to stock basic fan models in different sizes to serve this wide variety of uses.

THE SAME REED UNIT-FAN IS USED



Each Reed Unit-Fan is equipped with a heavy duty reversing switch with middle off position, and a 10-foot cord and plug. Fan case is finished with two coats of light ivory, baked synthetic enamel. Blades are sheet aluminum.

In its role as a window fan, the Reed Unit-Fan is attractive in appearance and provides cool comfort throughout the home.



"Comfort Cooling" in the office or any room in the house is easy with the Reed Portable Floor Fan.

Quickly and easily installed in the attic, the Reed Unit-Fan removes hot air and fills every room in the house with cool, moving air.

Only Reed "Comfort Cooling" Units, offer you these features. Dealerships are now available. . . . Write today for catalog, prices, etc.

R-U-F TRADE MARK

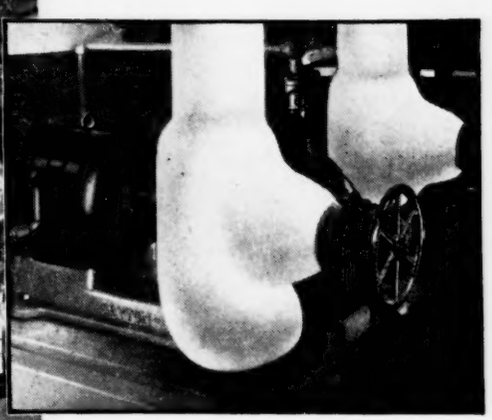
REED UNIT-FANS, INC.

Manufacturers of Ventilating Equipment

1001 St. Charles Ave., New Orleans 8, La., U.S.A.

Certified Ratings AMCA

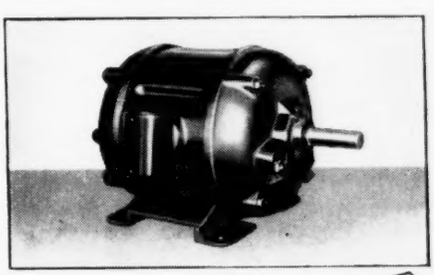
BUILDING for BIG BUSINESS



Pictured above is one of the 25-horsepower Wagner Polyphase Motors that drive the compressors in this system. Twenty-eight additional Wagner Motors are used in the complete installation.

Wagner Motors help keep it comfortable...

St. Louis' Continental Building boasts a roster of tenants that reads like "the Blue Book of American Business." One of the reasons why these leaders of industry have chosen this building to house their branch offices, is the fact that they realize how year 'round air conditioning increases employee efficiency.



The air conditioning engineers who installed the system in this building know that a modern "weather plant" can function properly only if it is equipped with dependable, efficient motors. That's why Wagner Quality Motors were chosen for this job, as they are for thousands of industrial, commercial and home applications.

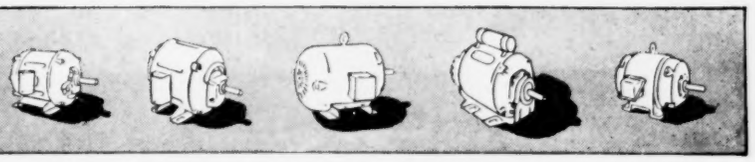
Wagner Motors are famous for their sturdy dependability and efficient operation. If you use motors, it will pay you to investigate Wagner's complete line of motors for a wide range of applications. Users of Wagner Motors also profit by our quick, convenient, nation-wide service facilities.

Twenty-nine branch offices, located in principal cities, are ready to assist you, without obligation, whenever you have a motor problem. Write for Bulletin MU-185 for information on the complete line of Wagner Quality Motors.

Wagner Electric Corporation
6463 PLYMOUTH AVE., ST. LOUIS 14, MO., U. S. A.

Consult Wagner Engineers on all Electric Motor Problems

Wagner Electric Corporation EST. WE 1891

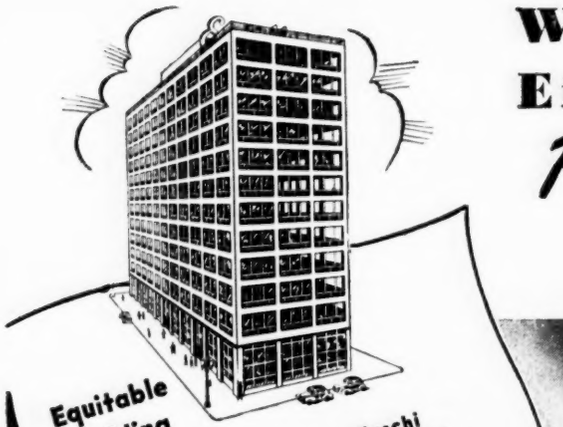


M48-4

• ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE PRODUCTS •

When Specifications Call For Efficient Air Distribution *Plus* Perfect Blending . . .

It's AGITAIR TYPE R



Equitable Building
Portland, Oregon
Architect: Pietro Belluschi
Engineer: J. Donald Kroeker
Contractor: Thompson Sheet Metal Works

For the "new look" in ceilings . . . look to Agitair Type R. Why? Because exclusive Agitair Type R design combines maximum air distribution efficiency with attractive units that blend with lighting.

The Agitair Type R adds more than beauty. It provides correct volume of air with 100% control of air distribution in any shape area, from any location—with no drafts, no blank corners, no hot spots, no cold spots. Patented Construction permits it to be assembled into numerous patterns which divide the air and distribute it noiselessly in one, two, three, or four directions in proportion to the area served. Assembled from standard parts, even the most complicated shapes are economical.

Today, more and more specifications call for efficient air distribution plus perfect blending with planned lighting. Get the facts on Agitair Type R.

Write for Complete Data

AIR DEVICES, Inc. • **17 East 42nd Street** • **New York 17, N. Y.**

CEILING AIR DIFFUSERS AIR FILTERS ROOF EXHAUSTERS

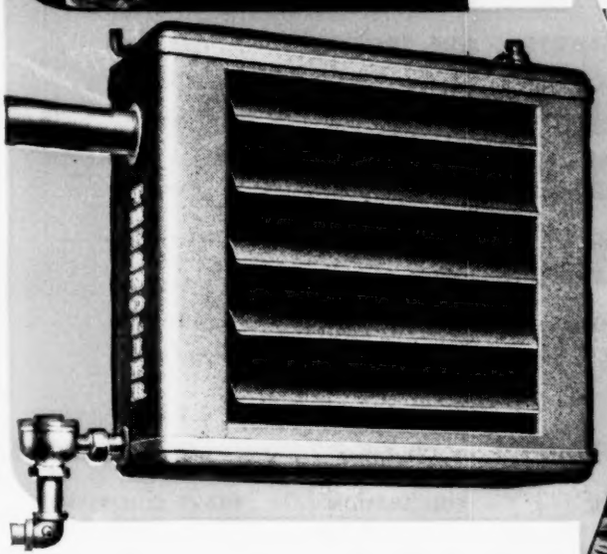
In the mood . . . for buying

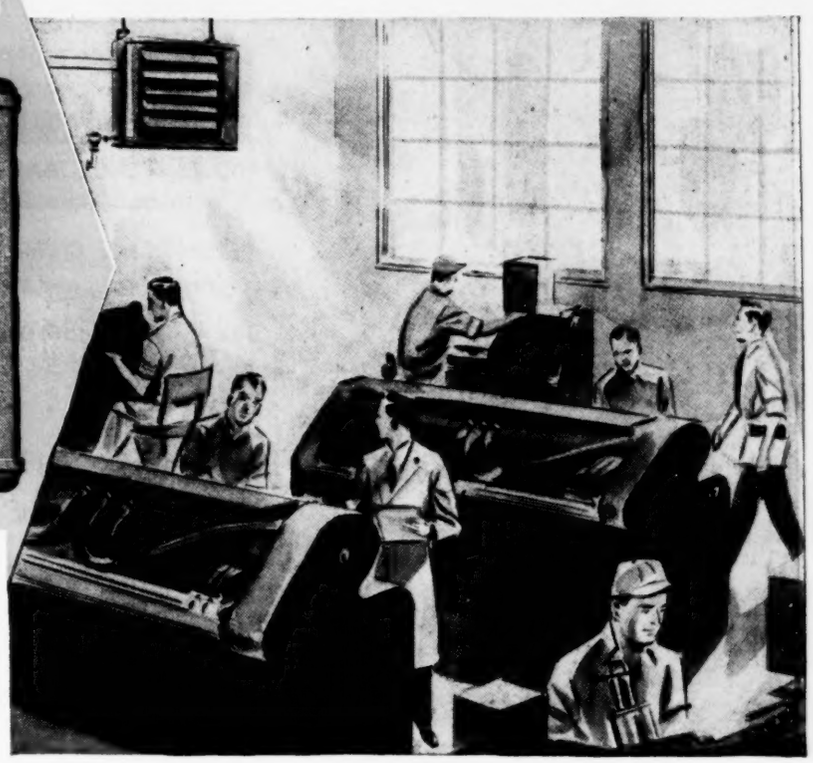
THERMOLIER UNIT HEATERS

While last January's heating headaches are still fresh in their minds is the time to pick up some nice contracts from firms in your locality. If you delay, it will be fall before they'll talk business and then you'll be turning down jobs for lack of time and materials.

Grinnell or your local Thermolier Distributor will be glad to work with you to help you line up some of these jobs early. We can show your prospects how Thermolier Unit Heaters distribute heat uniformly *where they want it*, and often save up to 27% of scarce, expensive fuel.

Thermolier's 12 points of superiority place it first for efficient, trouble-free operation . . . for full value from fuel dollars. Thermolier catalog 6-E tells the whole story. Grinnell Company, Inc., Providence 1, R. I.





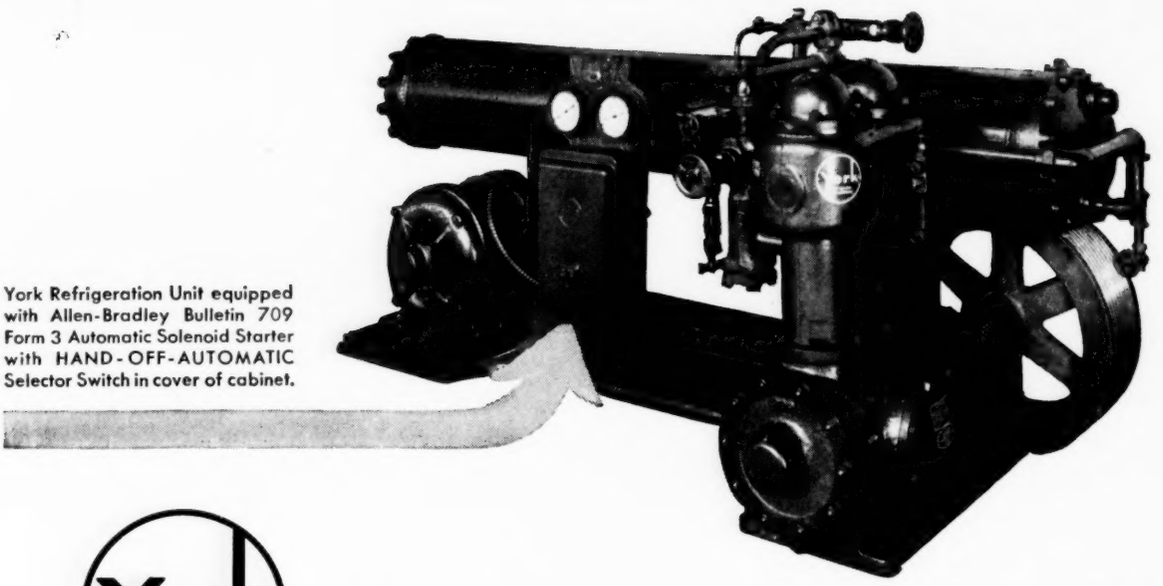
WHAT THERMOLIER'S SUPERIOR FEATURES MEAN TO YOUR CUSTOMERS

- Maximum radiation from all surfaces at all times, because exclusive internal cooling leg provides continuous drainage of condensate. This feature also permits use of a thermostatic trap, the simplest and least expensive type of trap.
- Quiet, trouble-free operation. Pronounced pitch of the tubes assures complete drainage of condensate. Annoying and destructive water hammer is eliminated.
- Safety and durability are assured with leak-proof tube-to-header construction.
- Damaging strains caused by expansion and contraction are eliminated by "U" type expansion tubes.
- Additional desirable advantages from eight other features.

GRINNELL

FOUNDED 1850

WHENEVER **PIPING** IS INVOLVED



York Refrigeration Unit equipped with Allen-Bradley Bulletin 709 Form 3 Automatic Solenoid Starter with HAND-OFF-AUTOMATIC Selector Switch in cover of cabinet.

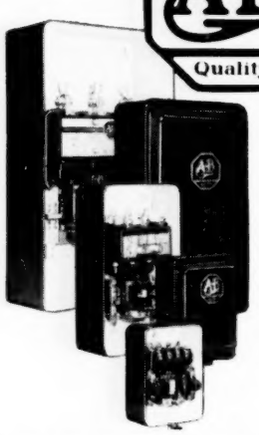
York

A-B Quality

REFRIGERATION UNITS

equipped with

Trouble-Free Motor Controls



The Allen-Bradley Bulletin 709 line of solenoid starters will handle motors up to 100 hp, 220v; 200 hp, 440-550 v. In various enclosures.

ALLEN-BRADLEY STARTERS ARE TROUBLE FREE. Only one moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

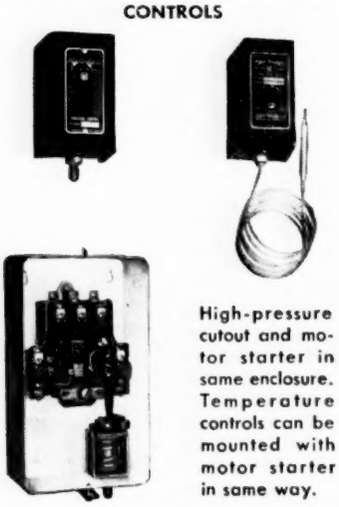
NO CONTACT MAINTENANCE. Allen-Bradley patented silver alloy contacts never need cleaning, filing, or dressing.

DEPENDABLE OVERLOAD RELAYS. Allen-Bradley thermal relays are accurate and dependable even after long service.

The A-B trademark stands for millions of trouble-free operations. Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wisconsin.

ALLEN-BRADLEY AIR-CONDITIONING AND REFRIGERATION CONTROLS

PRESSURE AND TEMPERATURE CONTROLS



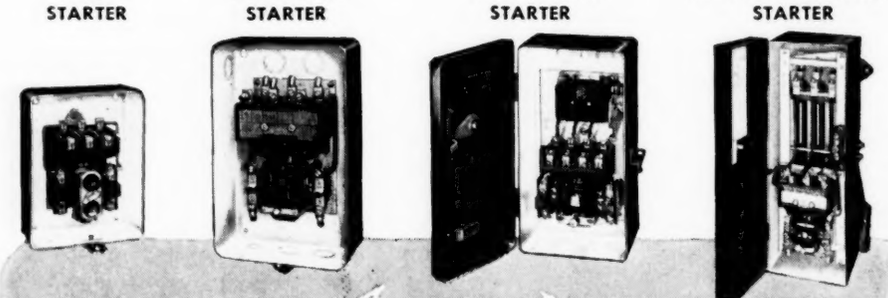
High-pressure cutout and motor starter in same enclosure. Temperature controls can be mounted with motor starter in same way.

MANUAL STARTER

AUTOMATIC STARTER

COMBINATION STARTER

HEAVY COMPRESSION STARTER

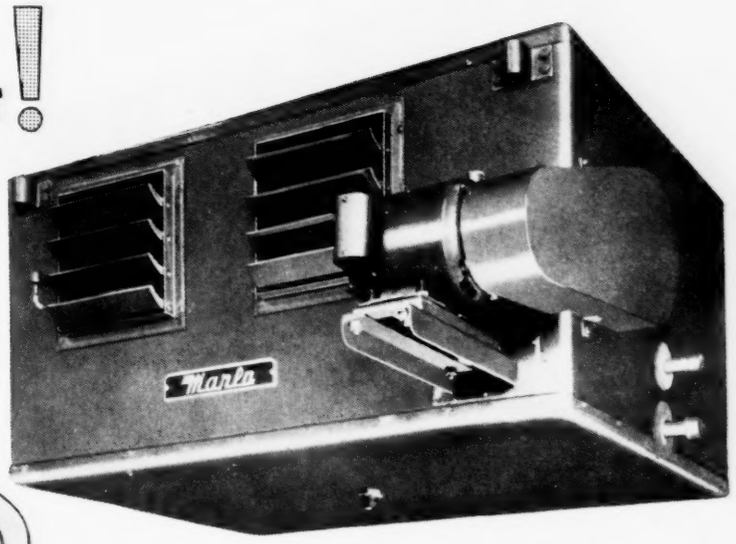


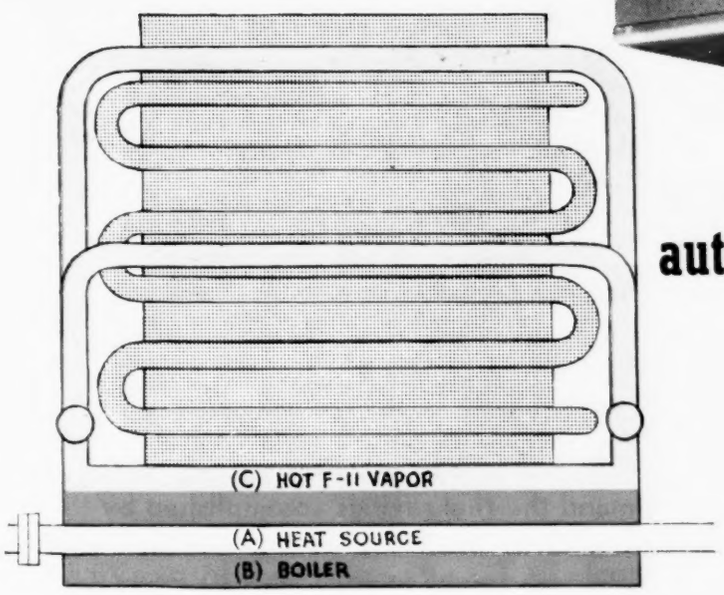
ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

ANOTHER **MARLO** FIRST!





automatic Vapo* DEFROST system

HERE'S HOW IT WORKS: Heat source (A) vaporizes the sealed charge of Freon 11 (Trichloromonofluoromethane) in boiler (B). Vapor circulates through tubing (C) interspersed between refrigeration coils, quickly defrosts them.

DEFROSTS WITH SPEEDY TROUBLE-FREE F-11 VAPOR

An entirely new, faster, foolproof principle to end your defrosting troubles! • No water • No pumps or other moving parts • No intricate electric control system.

performs equally well with . . . { **electric heating elements**, **steam or exhaust gases**, **heat of compression**, **or any other source of heat**

New LTV Low Temperature Vapor Defrosting Unit features lightweight all-aluminum construction, squirrel cage centrifugal blowers and attractive baked hammerloid finish.

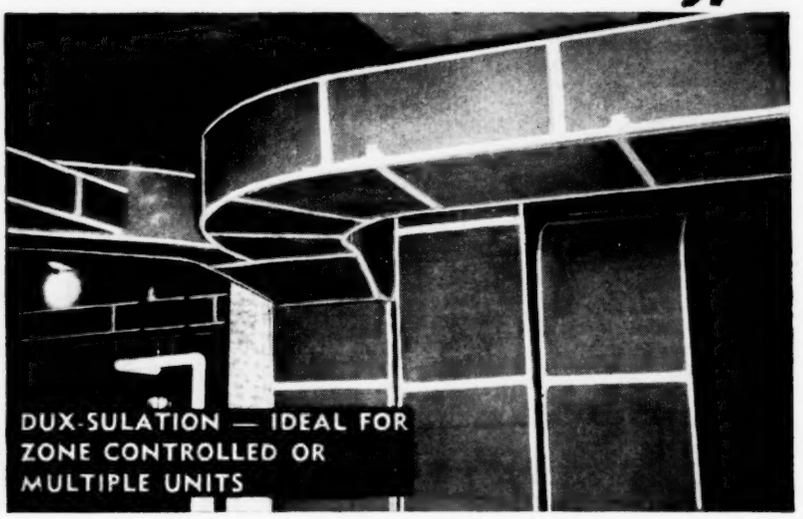
• May we send you descriptive literature?

MARLO HEAT TRANSFER
Since 1925

* Copyright 1948, Marlo Coil Company. Patent Applied For.

MARLO COIL CO. / ST. LOUIS 10, MO.

It Isn't too Early-



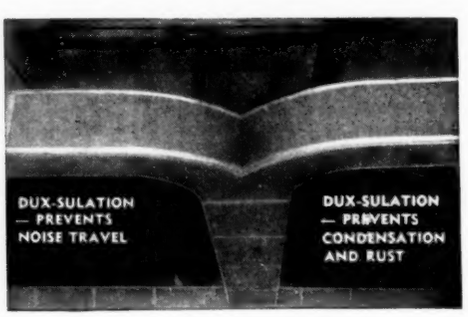
to think about

SUMMER COOLING

Now is the time to "write in" Asbestos Protected DUX-SULATION into your specifications for efficient COOLING SYSTEMS and AIR CONDITIONING in all types of buildings—Theatres—Churches—Hotels—Offices—Factories—etc.

Today's higher FUEL and POWER COSTS demand the real savings accomplished by this All-Purpose Insulation—prevents 75% of your present heat loss (K factor .27 B.T.U.) Dux-Sulation also quiets NOISES—absorbing 70% of sound in less than 10 lineal feet —also prevents condensation, duct sweating and rust. The low frictional resistance is only F=0.0001322.

This efficiency enables you to maintain BALANCED and CONTROLLED temperatures, creating better working conditions and real comfort—at LOWER cost of operation.



Prevent noises from one area being communicated into other areas, offices, studios, apartments, etc.

DUX-SULATION IS ESPECIALLY MADE FOR AIR CONDITIONING

Made in ½" and 1" thickness. Convenient to handle in stock and on the job. Contains 100 square feet and is easy to apply without waste on inside or outside of round or rectangular ducts. Built to stand hard use and will LAST for many years (requires no painting).

Don't get caught short—order today—available for immediate delivery—comes complete for easy installation.

Write Today for Bulletin No. 404-V.

GRANT WILSON, INC.
141 WEST JACKSON BLVD AT LA SALLE ST CHICAGO 4, ILL
22nd Floor, Board of Trade Bldg Phone Wabash 8220

GET EXTRA SERVICES BY ORDERING DUX-SULATION FROM YOUR LOCAL SUPPLY HOUSE

THROUGHOUT CANADA — Atlas Asbestos Co., Ltd., Montreal — Toronto — Winnipeg — Vancouver

Architects, Mills & Petticord, Washington 2, D. C. • Contractors, James Plumbing & Heating Co., Inc., Alexandria & Richmond, Virginia • Andre Merle Associates, Registered Engineers, Washington, D. C.

1500 APARTMENTS - 100 Buildings

Belleview Apartments - Fairfax, Virginia

Why does Sarcotherm receive preference when exacting comparisons of controls for hot water or radiant heating systems are made? It always boils down to the fact that no other system can give more comfortable heat and that the simplicity, low first cost and substantial fuel savings of Sarcotherm make it an obvious choice.

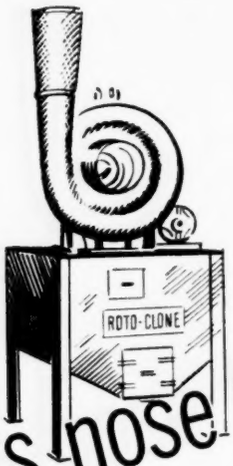
The control valve is as simple as a water blender in fact, it is an adaptation of a Sarco product that has given satisfactory service for years. Water temperatures are continuously modulated as called for by changes in outside temperature, insuring utmost comfort and fuel economy.

Ask the Sarcotherm Heating Engineer nearest you for user testimonials in your vicinity. Cat No. 500 will be sent on request.

10

Sarcotherm

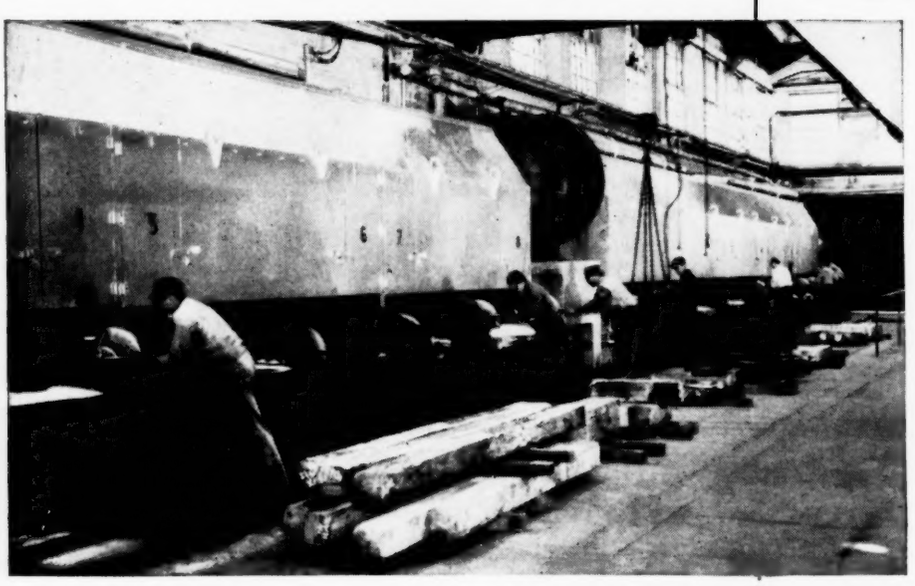
SARCOTHERM CONTROLS, INC. • Empire State Bldg. • NEW YORK 1, N. Y.



It has its nose to the Nation's Grindstone

More Grinding Wheels are exhausted by the Type D Roto-Clone than any other make of dust collector

MAKE the rounds of industry. Check the dust collecting units serving the heavy duty grinding operations. You'll soon find the favorite. It's the Type D Roto-Clone.*



And here's why the Type D has worked its way into the No. 1 position. This high efficiency dynamic dust precipitator combines the functions of exhauster and dust separator in a single, compact, self-contained unit. One moving part—the impeller—draws in the dust laden air, separates the dust, delivers the collected material to storage hopper on which it is mounted and expels the clean air all in a single operation. The Type D is economical to operate, easy to install and can be located at or near dust source to eliminate long pipe runs.

You can install the Type D Roto-Clone as a central system or to serve a single dust producing operation. Precleaner attachment is supplied where chips, shavings and heavy concentration of abrasive dust are to be handled. For complete information ask your local AAF representative for copy of Bulletin No. 272 or write direct to . . .

AMERICAN AIR FILTER COMPANY, INC.

294 Central Avenue, Louisville 8, Kentucky

In Canada: Darling Bros. Ltd., Montreal, P. Q.

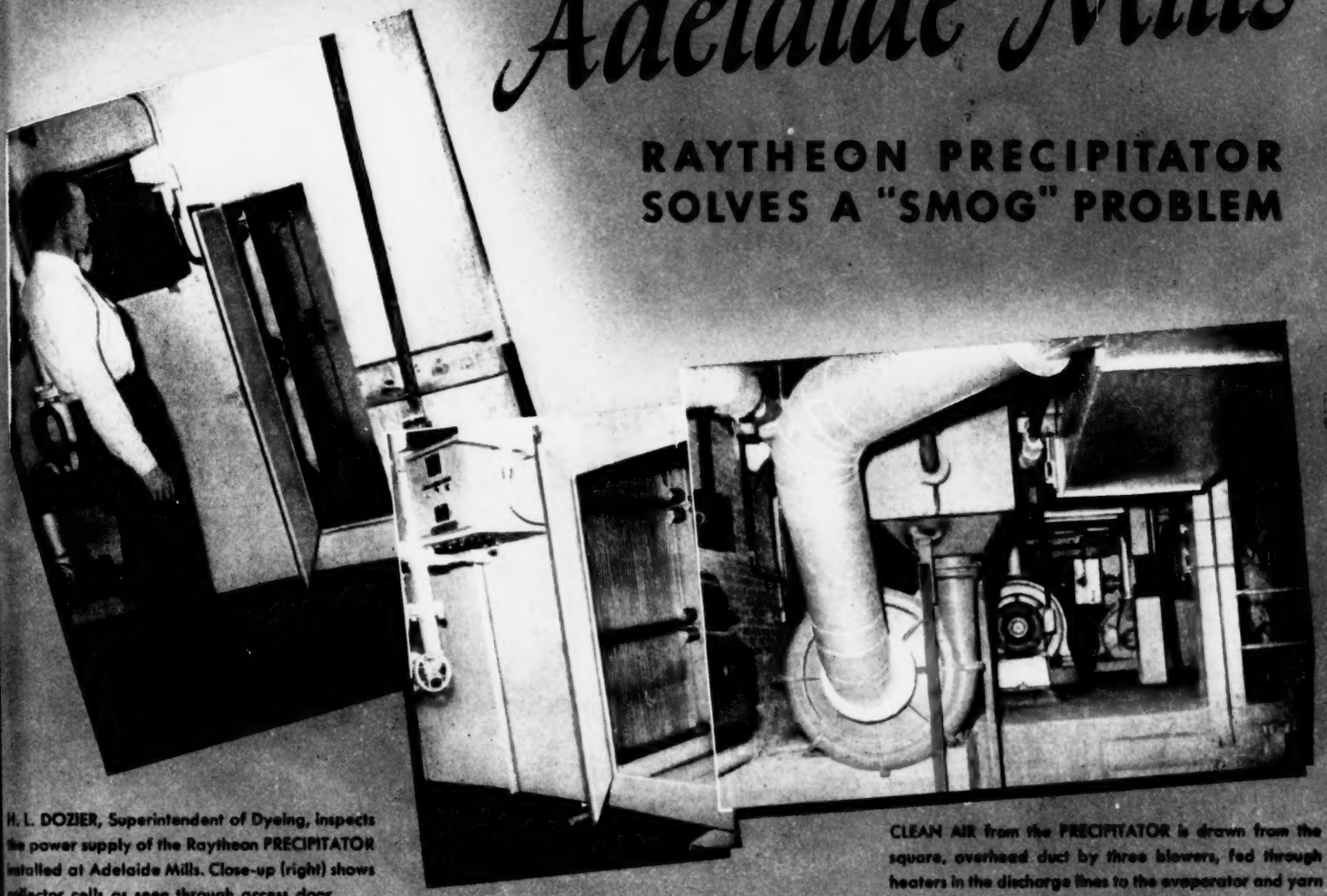
**Roto-Clone is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT

NOW YARN COMES CLEAN FOR *Adelaide Mills*

RAYTHEON PRECIPITATOR SOLVES A "SMOG" PROBLEM



H. L. DOZIER, Superintendent of Dyeing, inspects the power supply of the Raytheon PRECIPITATOR installed at Adelaide Mills. Close-up (right) shows collector cells as seen through access door.

CLEAN AIR from the PRECIPITATOR is drawn from the square, overhead duct by three blowers, fed through heaters in the discharge lines to the evaporator and yarn dryers. Note the neat handling of restricted space.

ANNISTON, ALA., is a busy town and its many factories burn soft coal. The resulting "smog", plus dirt and fly from the mill itself, created a problem for Adelaide Mills. Often as much as 5% of their yarn was spoiled by dirt in the air blown through packages during drying operations. They tried mechanical filters which quickly clogged, slowed drying, often reduced production as much as 50%. What to do?

Raytheon PRECIPITATOR Now Cleans The Air Electronically

A Raytheon PRECIPITATOR was installed in the blower system feeding hot air to the extractor and yarn dryers. Air flow is no longer restricted by clogged filters. Drying production has increased . . . *and no yarn is spoiled by dirt blown through the packages.*

CLEAN AIR PAYS. Air cleaned electronically by Raytheon PRECIPITATORS is a valuable asset to factories, mills, stores, public buildings, institutions. It has countless possibilities as a waste saving, production improving, goodwill building, employee pleasing, customer attracting proposition. Look into it today. An air cleaning engineer from a nearby Raytheon District Office will gladly give you complete information. Company engineers, consulting engineers and heating and ventilating contractors will want Bulletin DL-P-503 for their files.

RAYTHEON

Excellence in Electronics

RAYTHEON MANUFACTURING COMPANY

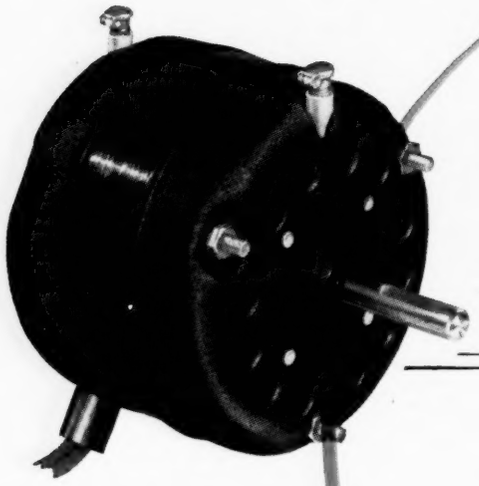
COMMERCIAL PRODUCTS DIVISION

WALTHAM 54, MASSACHUSETTS

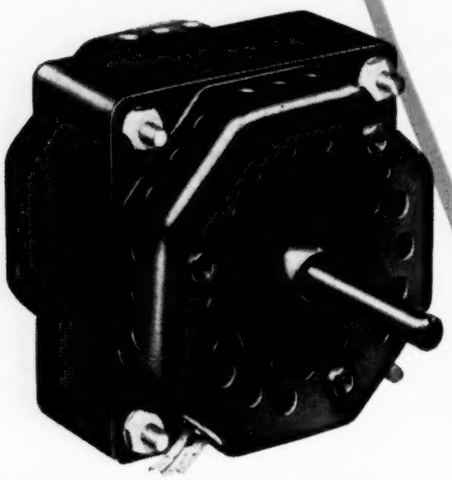
Industrial and Commercial Electronic Equipment, Broadcast Equipment, Tubes and Accessories

Offices: Atlanta, Boston, Chicago, Cleveland, Detroit, New York, Washington, D.C.

EXPORT SALES: Raytheon Manufacturing Company, International Division, 60 East 42nd Street, New York 17, New York



MODEL A is a 6-pole shaded pole induction motor built especially for driving fan blades at the slower controlled speeds of from 1050 R.P.M. down to 500 R.P.M. Outstanding advantages are extreme economy in operation, even, slow running speeds, and exceptionally quiet performance. Clockwise or counterclockwise rotation, but not reversible. Approx. 1000 R.P.M. full load speed. Size 4½" O.D. Semi-open or fully enclosed construction with oilers.



MODEL B is a 4-pole shaded pole induction motor. It is built especially for driving fan blades in unit heaters, blowers, air conditioners, air circulators and is also adapted to many other mechanical devices. Coming in three standard lamination stack thicknesses, the range of power is from 1/100th h.p. up to 1/25th h.p. Full load speed is 1550 R.P.M., maximum weight—approx. 5.6 lbs. Size 3⅜ inches square by 2⅞ inches over end brackets.

MAKE FANS GO!

with

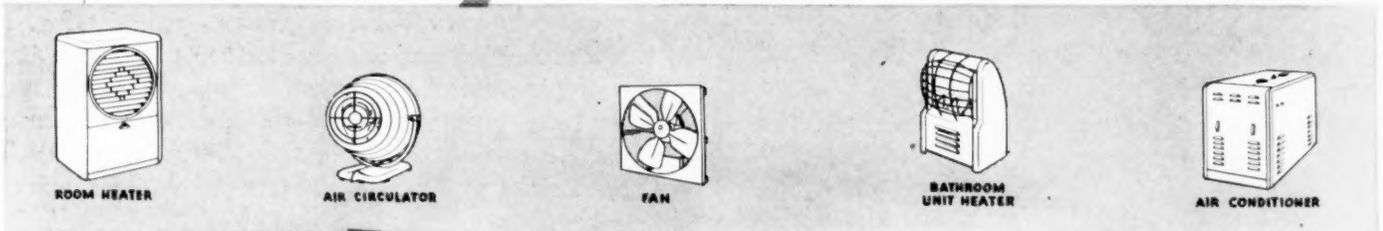
alliance motors

For driving fan blades in heating appliances such as space heaters, air conditioners, and air circulators, Alliance Motors are "tops". Motors like Models A and B are especially built for this purpose—they bring these big advantages:

(1) *Slower controlled speeds;* (2) *Flexible power range;* (3) *Lightweight, rugged construction;* (4) *Silent, smooth operation;* (5) *Mass production at low cost;* (6) *Operating economy.*

Power ratings for Alliance Fan Motors range from 1/100 h.p. up to 1/25 h.p. Speeds run from 500 to 1550 r.p.m. Motors come semi-open or fully enclosed, with or without oilers.

Drive your products to market with Alliance Motors.



WHEN YOU DESIGN—KEEP

alliance motors

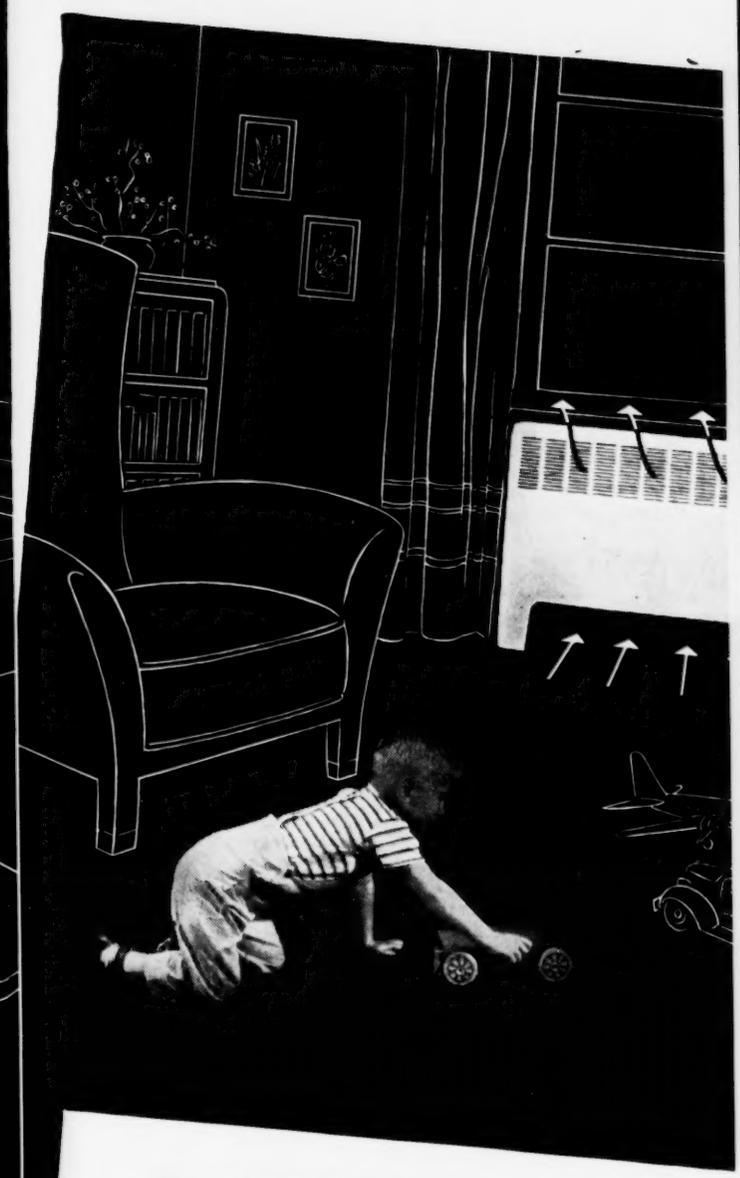
IN MIND

ALLIANCE MANUFACTURING COMPANY • ALLIANCE, OHIO

Export Department: 401 Broadway, New York 13, N. Y., U. S. A.

1 BLEND RADIANT HEATING...

See those arrows coming from the Modine Convector Panel below the window? That's *radiant heating*—mild radiant heat in just enough quantity to offset heat loss from window area.



2 WITH CONVECTION HEATING

These arrows illustrate *convection heating!* Hot water or steam passes through copper heating unit which draws cooler, floor-line air into bottom of convector where it's warmed, rises and passes out through grille.

RESULT:

Modine Convector Radiation ...the greatest forward step in modern heating science!

Two great heating principles blended into one—that's what Modine Convector Radiation offers you! This modern, combination heating is *the* dependable new hot water and steam heating system for moderate cost homes and apartments . . . as well as commercial and institutional buildings.

Best of all—Modine Convector Radiation now costs less than any other form of radiation. It gives you these *extra* advantages which you can't afford to overlook: 1) individual room control. 2) instant response to automatic controls. 3) gentle air circulation without the use of moving parts that wear out. 4) distinctive room charm and cleanliness without unsightly radiators.

If you're planning to build or modernize, specify Modine Convector Radiation. Call Modine's Representative listed in the "Where-to-Buy-it" section of your phone book. Or send for new, free Convector Booklet! MODINE MANUFACTURING CO., 1511 DEKOVEN AVENUE, RACINE, WISCONSIN.

Modine

CONVECTOR RADIATION

The modern "proved by use" heating method

CHECK THESE KEY MODINE FEATURES!

Easy to Clean

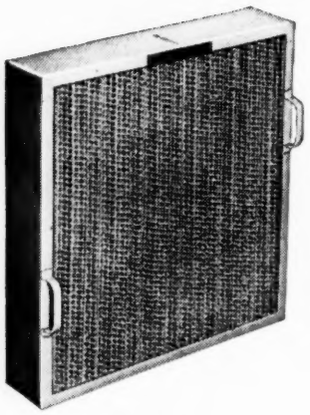
Modern Beauty

Adds to Living Space

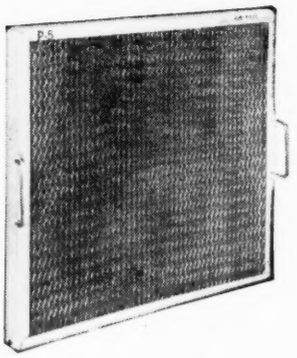
Priced for Today's Homes and Apartments

Close Temperature Control

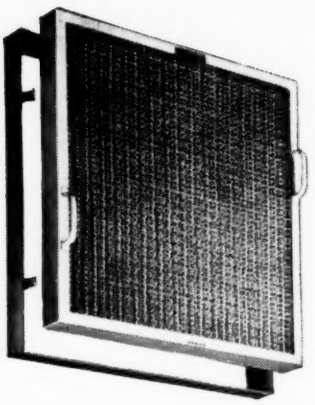
Easy to Install



HEAVY DUTY INDUSTRIAL filters for ventilating service where dust load is exceptionally high. (Type A)

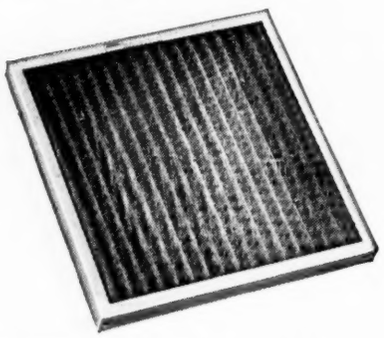


HIGH-VELOCITY panels for handling a large volume of air at low resistance. (Type P-5)

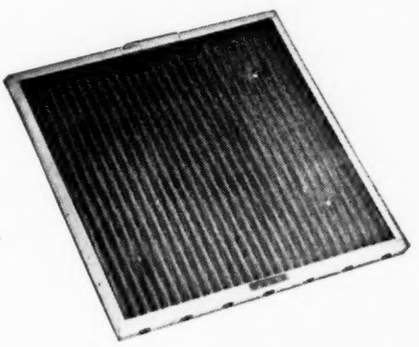


AVERAGE DUTY INDUSTRIAL filters for fresh air intakes. Large dust-holding capacity. (Type B)

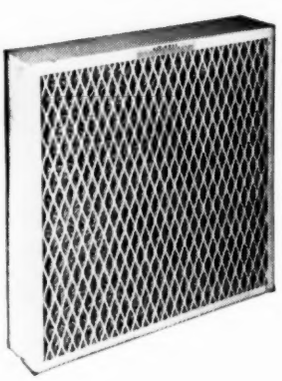
To filter air anywhere, specify AIR-MAZE



KLEENFLO filters for average duty residential and commercial ventilating applications. (Type K-1)



WATER ELIMINATING panels for removing entrained water from the air stream. All-bronze. (Type EKBB)



SPECIAL RAILROAD filters for fresh air intake on air-conditioned cars. (Type P-18)

GREASTOP filters for preventing grease nuisance and fire hazards in kitchen ventilating systems.

SELECTING THE CORRECT AIR FILTER, like so many other engineering problems, involves a compromise between ideal and practicable considerations.

This is exactly why Air-Maze engineers have designed —not one—but *many* types of all-metal, cleanable impingement filters for various ventilating applications. Each type has a proved record of field performance to justify its place in the ventilating industry.

Of this much we are certain: There is no *one* air filter that meets *all* the requirements of the ventilating engineer. But the chances are there is a particular Air-Maze filter that will handle any particular ventilating job.

We invite you to submit your air filtration problem to your nearby Air-Maze representative. He will gladly recommend the filter most suitable for your individual applications. Air-Maze Corporation, 5200 Harvard Avenue, Cleveland 5, Ohio.

AIR FILTERS
SILENCERS
SPARK ARRESTERS
LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

AIR-MAZE

THE FILTER ENGINEERS

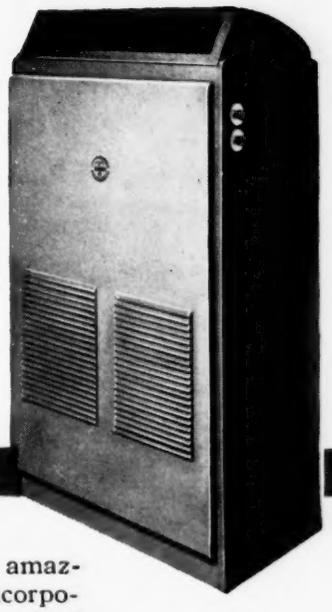
New-Compact

Marvel of Efficiency!

TYPHOON

Console Air Conditioner

1½-2-3-TON SIZES



THE TYPHOON CONSOLE is ideally suited for professional offices, little shops and stores, and homes.

Typhoon engineers have developed a new, amazingly compact packaged air conditioner that incorporates all the features that have made the standard Typhoon unit an accepted success in hundreds of installations throughout the country.

The Console unit delivers the same output per horsepower at the same low noise level as the larger unit. A radical new arrangement makes possible full sized coil, motor, compressor and condenser in a more compact unit. Thus, a lot of air conditioning is engineered (not crowded) into this small cabinet. The Typhoon designed parts assure long life and trouble-free performance.

The 1½, 2 and 3-Ton Typhoon Consoles are cased in cabinets made of heavy gauge furniture steel thoroughly insulated for quiet operation. A removable cover exposes the entire working mechanism for easy inspection.

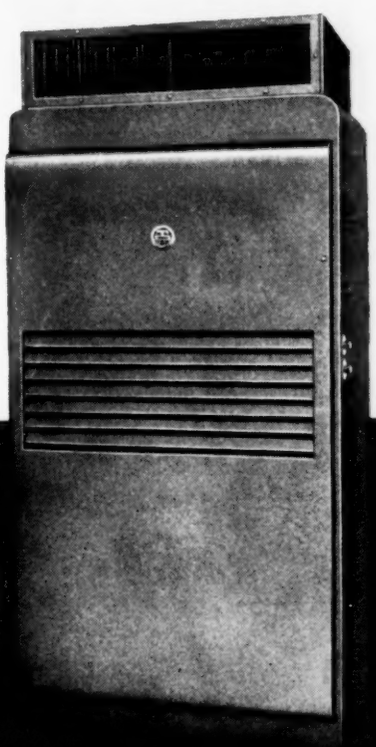
Steam **or hot water coils may be installed in Typhoon units for year-'round utility. All Typhoon units are carefully tested under actual working conditions before they leave the factory.**

Over 35 *years* of air conditioning experience is engineered into Typhoon units.

3-5-7-TON

PACKAGED AIR CONDITIONERS

These Typhoon units are ruggedly engineered of oversized components to insure full rated capacity, 12,000 BTU's per ton of rating, under the most difficult operating conditions. The oversized compressor operates at moderate speed, and low pressures are maintained even with high temperature water or for cooling tower operation. Typhoon units are particularly good where "water conditions are bad."

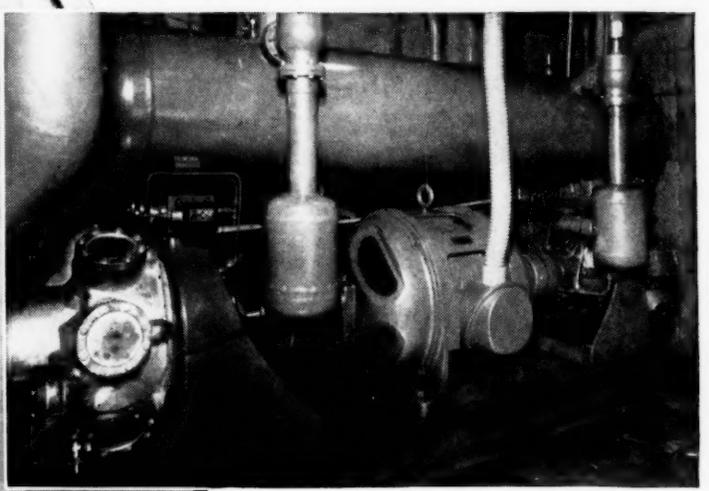


TYPHOON AIR CONDITIONING

TYPHOON

Nationally Advertised

ONE OF THE OLDER AIR-CONDITIONING INSTALLATIONS IN DETROIT...



● Smooth, vibrationless operation is attested by the fact this 14-cyl., 75-h.p. Radial Compressor is mounted on the floor above the soundproof broadcast studios.

...AND STILL GOING STRONG!

11 YEARS OF DEPENDABLE SERVICE!

– that is the record of the Chrysler Airtemp Air-Conditioning system installed in Detroit's radio station WWJ in 1937. The "inside story" of dependability like this is the story of outstanding Chrysler Airtemp engineering.

Chrysler Airtemp Air-Conditioning is noted for simplified installation and ease of servicing. For year-in-year-out reliability, coupled with low-cost, dependable operation, install Chrysler Airtemp Air-Conditioning. Call an Airtemp dealer today, or write us direct.

CHRYSLER AIRTEMP

DIVISION OF CHRYSLER CORPORATION

CHRYSLER AIRTEMP

AIR CONDITIONING • HEATING • COMMERCIAL REFRIGERATION

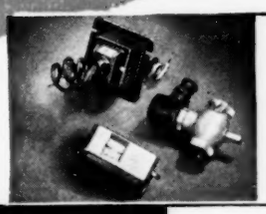
AIRTEMP DIVISION OF CHRYSLER CORPORATION

Dayton 1, Ohio

In Canada: Therm-O-Rite Products, Ltd., Toronto

Automatic Controls... Buy the Package

No other controls offer all these outstanding advantages



T-30 GAS HEATING SET

This set includes silent K-38 two-wire gas valve, T-70 two-wire Metrotherm and 115-24 volt transformer. Ideally adaptable to gas fired boilers, wall and floor furnaces, conversion burners and warm air furnaces.

T-40 GAS HEATING SET

Package set includes two-stage Thermostat, dual solenoid valve and Transformer. Provides fully automatic, hi-low firing, maintaining ideal temperature control and lowered fuel cost.

T-90 STANDARD THERMOMETER SET

Set combines improved B-60 gas valve, flush mounting Thermometer Thermostat and Pilot Generator. Positive remote temperature control for gas fired furnaces.

- Accurate Room Temperature Control
- Silent Operation
- Design Simplicity
- Self-Operated; No Outside Current Required, Integral Safety Control (B-60 Series Controls Only)

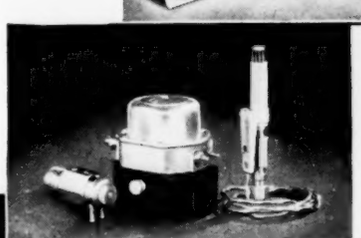
GENERAL CONTROLS presents seven of their convenient packaged sets for compact inventory and simple installation. Here are precision built, field proved package sets most frequently desired by heating contractors and engineers. Buyers can select complete sets in compact cartons; each set includes essential units required. Get improved performance at lower costs through *ENGINEERED* adaptability.

T-23 OIL HEATING SET

For remote thermostatic control of oil heating furnaces, circulating heaters, conversion burners, etc. Includes solenoid oil valve with by-pass adjustment for minimum flow regulation or pilot, two-wire metrotherm and transformer.

BX-230 STANDARD THERMOSTAT SET

BX-230 includes B-60-6B diaphragm gas valve, PG-6 Pilot Generator, and T-80-4 Thermometer type Thermostat with night cut-off. For wall and floor furnaces, circulators, etc.



BX-250 WATER HEATER SET

New all-gas control set combination combines L-61 Tank Thermostat, B-60-6B gas valve and PG-6 Pilot Generator. For hot water heating applications.

T-95 TIMER SET

Includes improved B-60 gas valve, Pilot Generator and Timer Thermostat. Pilot Generator provides operating current, main burner ignition and safety control.

For complete specifications covering the *GENERAL CONTROLS* broad line of *Automatic Pressure, Temperature and Flow Controls*, see the new 1946 Catalog 52C.
For Gas Heating Controls request Service and Instruction Manuals.

GENERAL CONTROLS 37-1

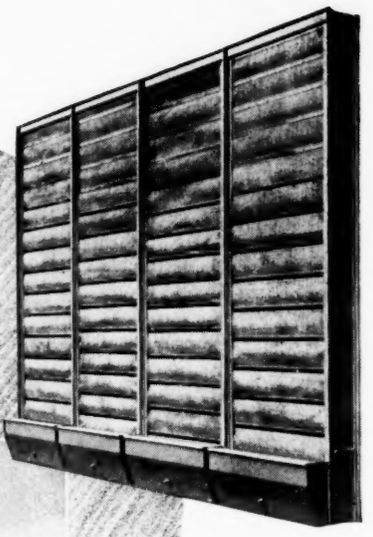
801 ALLEN AVENUE — GLENDALE 1, CALIF.

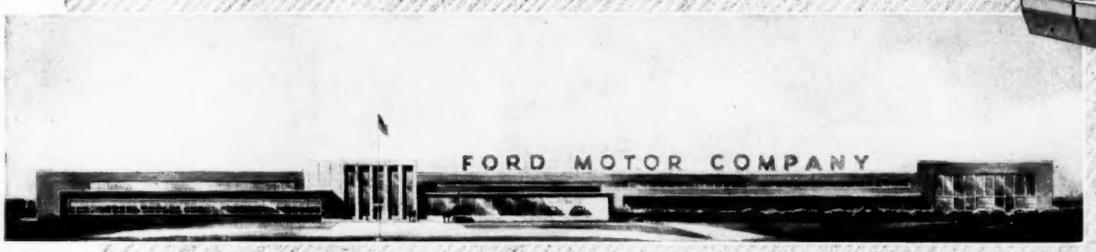
Manufacturers of Automatic, Pressure, Temperature & Flow Controls

FACTORY BRANCHES: PHILADELPHIA • ATLANTA • BOSTON • CHICAGO • DALLAS
KANSAS CITY • NEW YORK • DENVER • DETROIT • CLEVELAND • PITTSBURGH
HOUSTON • SEATTLE • SAN FRANCISCO • DISTRIBUTORS IN PRINCIPAL CITIES

IS THERE A STAYNEW IN *YOUR* FUTURE?

FORD MOTOR COMPANY SELECTS STAYNEW AUTOMATIC AIR FILTERS FOR TWO NEW PLANTS





New St. Louis Assembly Plant. Twenty-four installations handling total of 1,292,600 CFM.

New Atlanta Assembly Plant. Twenty-four installations handling 1,015,000 CFM.

Ford News Bureau Photos

ALL VENTILATION AIR for factories, offices, and cafeterias in both these ultra-modern plants is filtered through Staynew Automatic Air Filters.

Staynew Filters were chosen after careful testing and investigation for efficiency, low maintenance and low operating costs.

More and more modern builders are discovering that Staynew Automatic Air Filters give *better results* at *less cost.* Without obligation to you, Staynew engineers will show you *how* and *why.*

STAYNEW AUTOMATIC AIR FILTER GIVES YOU THESE 10 FEATURES

1. Double Filter Curtains
2. Compressed Air "Conditioning" of Curtains
3. Cleaned Panels Always on Filtered Air Side
4. Highest Efficiency of Any Mechanical Type Self-Cleaning Filter
5. Motor and Controls on Clean Air Side
6. Momentary Contact Time Switch for Testing
7. Shear Pin Protection of Moving Parts
8. Remote Mounting of Control Mechanism if Desired
9. Gear and Roller Chain Drive
10. Nation-wide Service on Motor and Controls

FOR COMPLETE DETAILS WRITE:

DOLLINGER CORPORATION

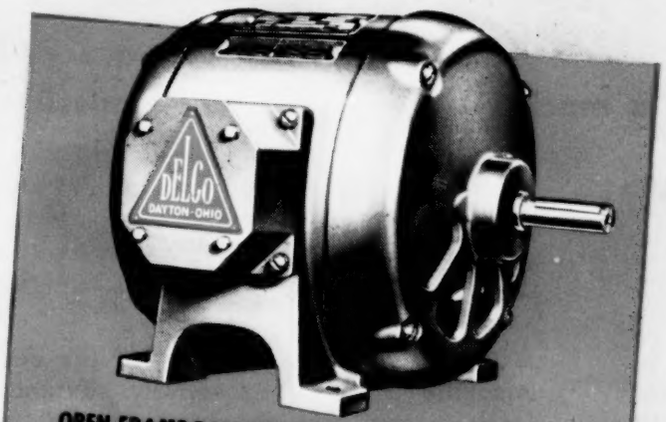
DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

15 CENTRE PK., ROCHESTER 3, N. Y.

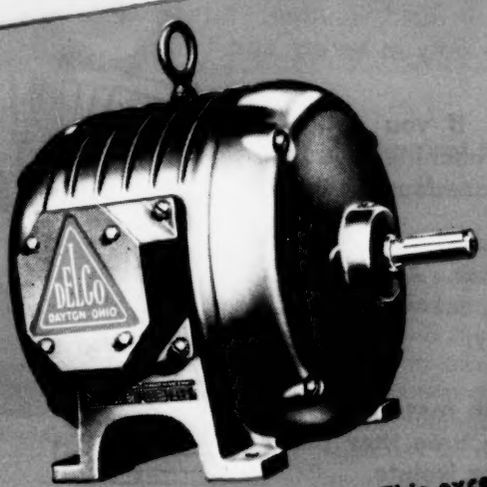
REPRESENTATIVES IN PRINCIPAL CITIES

DELCO

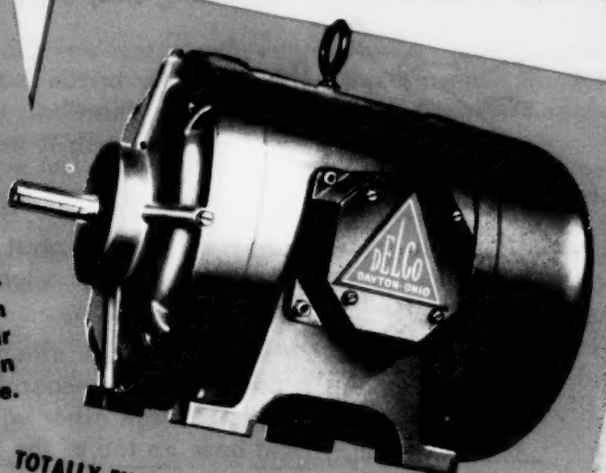
The Right Motor for Each Requirement!



OPEN FRAME BALL BEARING—This frame is compact, rugged, and allows a large volume of cooling air to flow through the motor. The accessibility of all parts makes this type motor popular with maintenance men. It has proved most satisfactory for general popular applications where dust and dirt are not important factors. Now available in frame sizes 203 through 365 inclusive.



TOTAL ENCLOSED BALL BEARING—This exceptionally strong frame is desirable in locations where dust and dirt in the air cannot be controlled. Now available in frame sizes 203 through 225 inclusive.



TOTALLY ENCLOSED FAN-COOLED BALL BEARING—The ideal motor frame to protect motor windings and rotating parts in atmosphere laden with injurious particles—iron dust, foundry sand, etc. This type now available in frame sizes 204 through 505 inclusive.

For additional information on Delco Motors, write to Delco Products for complete data.

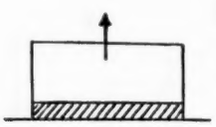
DELCO PRODUCTS
DAYTON, OHIO

DELCO MOTORS

DIVISION OF GENERAL MOTORS CORPORATION

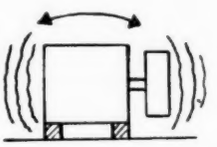
Don'ts for machine isolation

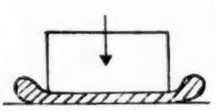
When you are called on to isolate a machine against the transmission of vibration, avoid these pitfalls



Don't put a solid sheet of cork, rubber or other material under the complete base. Nine chances out of ten it's too much, it won't help much and you are wasting your money. Isolation must be right or it is no good.

Don't neglect the overhang of the drive. If you do, your machine will rock excessively. Extend the base and the isolation out under the drive, and your rocking troubles will be minimized.



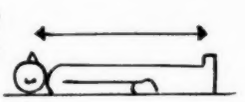


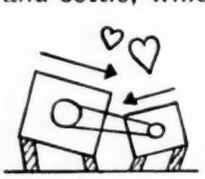
Don't use a material that will soften in warm weather and flow out from under the base. It's just as bad to use a material that will harden in cold weather. Either will give you questionable isolation only in spring and fall.

Don't ignore uneven weight distribution. If you do, the isolation will compress unevenly and the machine will tip. Excessive tipping or rocking may lead to serious trouble.

Don't use a brittle isolator. Avoid materials that harden with age or vibration. Impact will break it up and the floor sweeper will brush it away.

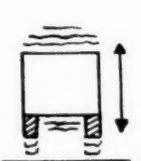
Don't use a dead or lifeless material. Such materials may absorb vibration when first installed, but in time they pack and settle, which means that they no longer isolate.





Don't encourage affectionate machines. If a fan and it's motor are both separately, resiliently mounted, they tend to nod to each other with resulting drive distortion. Have a rigid base on top of the isolation.

Don't make a bouncing ball out of your machine. It's important that the isolation be just right, not too hard nor too soft. At one point in its softness resonance develops and with it plenty of trouble.



Machinery isolation is our business. We have a complete selection of units and bases that avoid all of these difficulties. They save you valuable installation time and engineering headaches.

Write for complete literature.

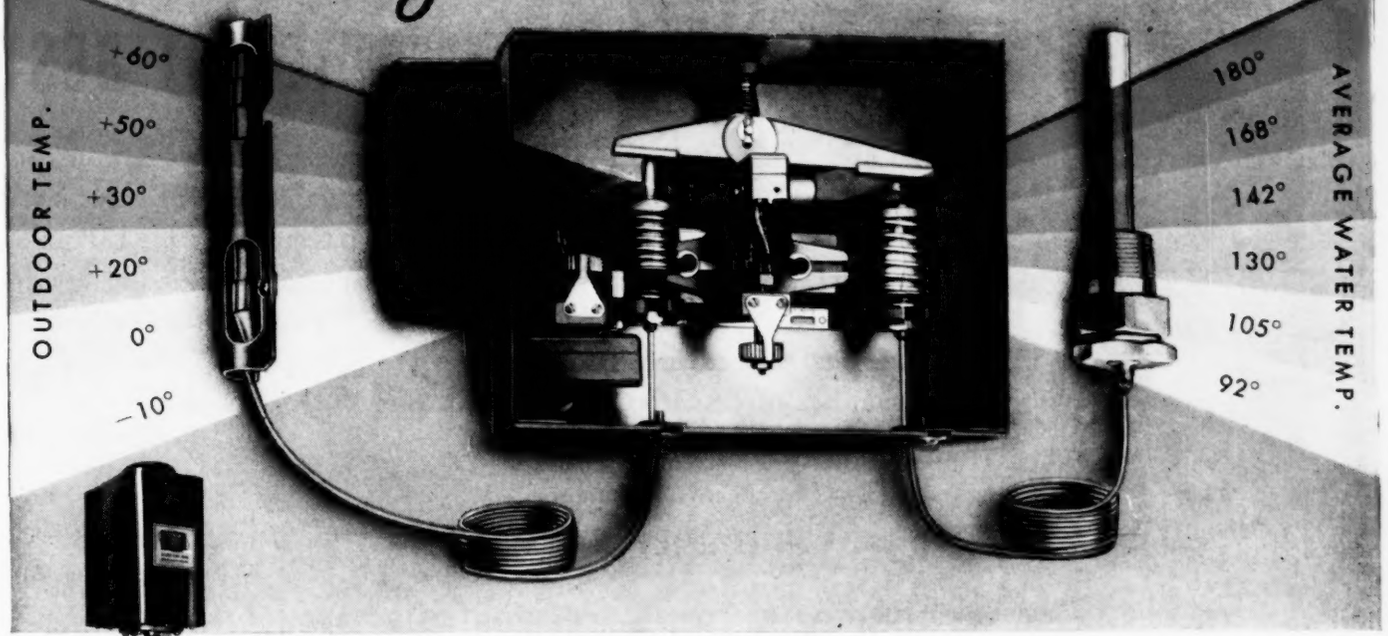
THE VIBRATION ELIMINATOR COMPANY

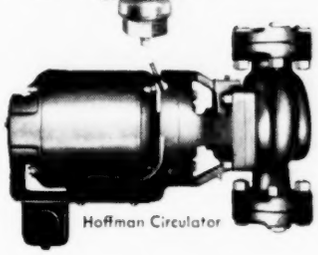
10-28—47th Avenue, Long Island City 1, N. Y.

THE Vibration Eliminator COMPANY

MIRACLE CONTROLLER

...Automatically balances water temp. with weather





A Mechanical BRAIN that precisely controls admission of heat to *continuously circulating water* – in amounts to exactly offset heat losses

That is what heating engineers sought to do for years—that is exactly what Hoffman's Series 90 Controller adds to *any* hot water heating system—having either panels, baseboards or radiators. The Series 90 Controller is *sensational in its automatic maintenance of even room temperature* . . . in its ability to conserve fuel by completely eliminating wasteful over-heating, such as occurs in the ordinary intermittent type operation. These features and advantages of Hoffman Controls are an asset you should use in closing contracts for new radiant heating projects and remodeling jobs. *Zoning* of apartments or sections of large residences to suit personal preference or functional activities of the building may be obtained with Series 90 Systems. The diagram at left shows the basic operating principle of this system. Thousands of installations now in operation acclaim its merits.

HOW THE HOFFMAN SERIES 90 SYSTEM COMBINES CONTINUOUS CIRCULATION WITH WATER TEMPERATURE CONTROL

When the Control Valve is closed, continuously circulating water by-passes the boiler without withdrawing heat. When water has lost heat, as noted by the Water Temperature Bulb, the Comfort Controller slowly opens the Control Valve, permitting hot water from the boiler to enter the circulating stream. When sufficient hot water has been admitted to restore the proper temperature to the circulating water, the Valve is closed by the Controller. This cycle repeats automatically in anticipation of weather changes.

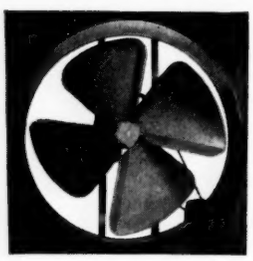
HOFFMAN SPECIALTY COMPANY, Dept. HV-4, 1001 York St., Indianapolis 7, Ind.

HOFFMAN SERIES 90

Hot Water System Controls

Guardian of your Fuel and Comfort

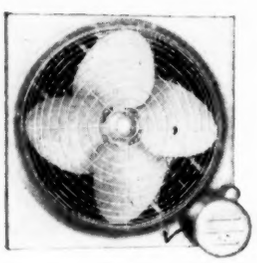
SCHWITZER-CUMMINS FANS and BLOWERS *give you*



1

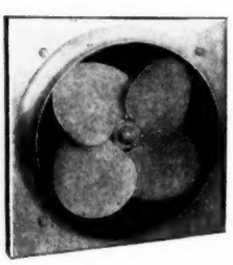
AIR HANDLING AT ITS QUIETEST BEST

You will need the best there is in quality, performance and design in your merchandise for 1948, and all at a reasonable price. With prices what they are, you must have convincing value to offer. Schwitzer-Cummins Fresh-Air Maker fans and Hy-Duty blowers can't be beat for big air delivery, quiet operation, selling features and looks. You will like everything about them and will cheerfully O.K. this year's prices. And there are a surprising number of essential types and sizes to help you get the business and boost your profits.



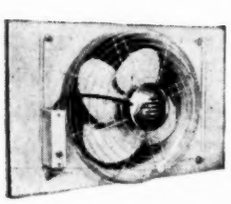
2

❶ ATTIC VENTILATORS
❷ WINDOW FANS
❸ EXHAUST FANS
❹ ADJUSTABLE WINDOW FANS
❺ PORTABLE CIRCULATING FANS
❻ DOUBLE INLET BLOWERS



3

With our enlarged facilities we can now give good service to more dealers and distributors and have some prime territory open. We would like to present a portfolio of new literature descriptive of some very unique and interesting developments for this year's ventilating business. It is yours for the asking.



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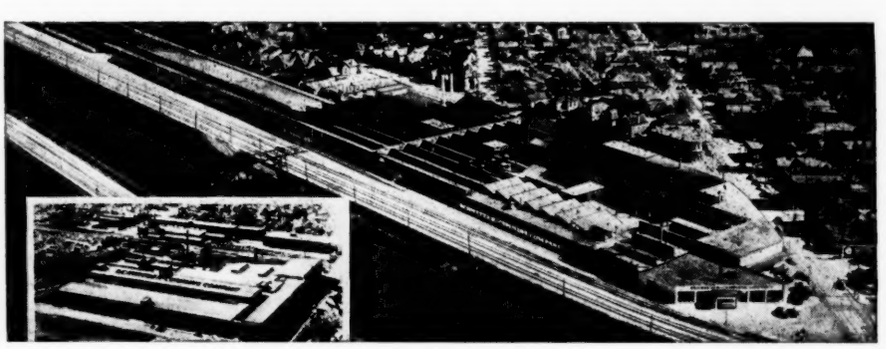

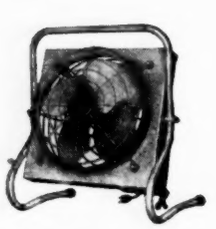

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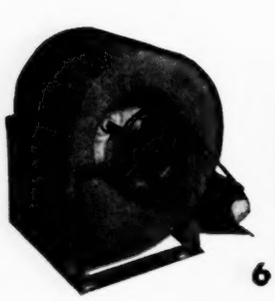

6

SCHWITZER-CUMMINS COMPANY
VENTILATING DIVISION
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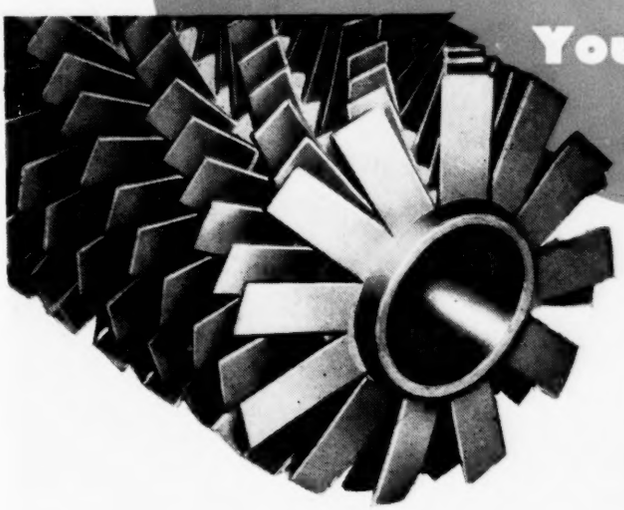
ENGINEERS AND MANUFACTURERS OF FINE FANS FOR 30 YEARS

We "Custom Tailor" FINNED TUBING —To Fit Your Needs



TILCO FIN TUBING

If you're designing a heat transfer unit you may find we can solve most any bothersome problem—because we can "tailor" our tubes so very many ways:

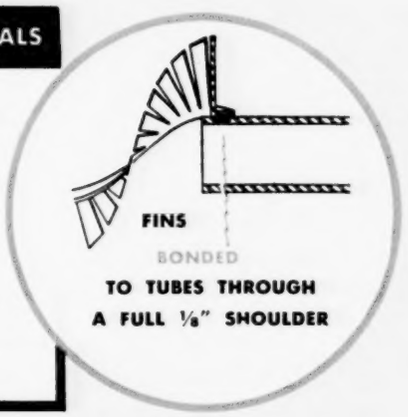
YOUR CHOICE OF METALS

Steel fins can be welded to Steel tubes.

Monel fins can be welded to Steel tubes.

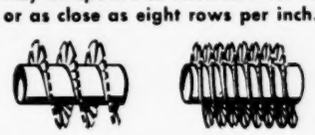
Steel fins can be welded to Cupro-nickel.

Copper fins can be solder bonded to Steel or Copper tubes.



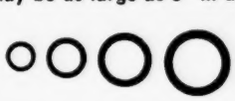
YOUR CHOICE OF DIMENSIONS

Fins may be spaced as wide as three rows per inch or as close as eight rows per inch.



Fins may be any desired height starting with ¼".

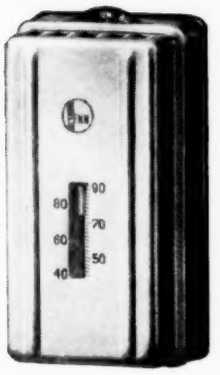
Tubes may be as small as ⅜" in diameter.
Tubes may be as large as 6" in diameter.



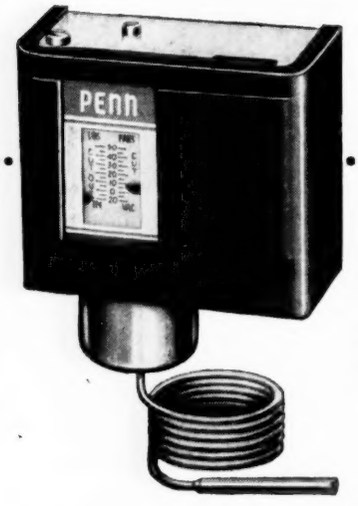
● Because of this great manufacturing flexibility (without any extra costs for new dies or special fixtures) we have often been able to make suggestions that have resulted in such typical achievements as—more efficiency with fewer tubes—less space without b. t. u. loss—less costly installations—workable units fitted into awkward areas—more effectiveness than engineers believed possible. It therefore may be interesting to you to ask for our data sheets or, in specific cases, to have us make what suggestions we can. Of course there's no obligation. We'll be delighted to serve you any way at all.

DAVID E. KENNEDY, INC.
350 Fifth Ave., New York 1, N. Y.

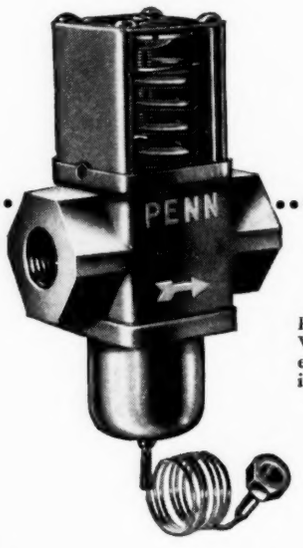
Penn Series 221 Solenoid Valves perform dependably in a wide variety of refrigeration applications.



Penn Unit Heater Thermostat embodies the heat anticipation principle and has a built-in "on-off" switch.



Penn 270 Series Refrigeration Controls incorporate 2-pole construction and a direct-reading calibrated scale which shows both cut-in and cut-out points.



Penn Series 246 Water Valves are built in threaded and flanged styles and in sizes from ⅜" to 2½".

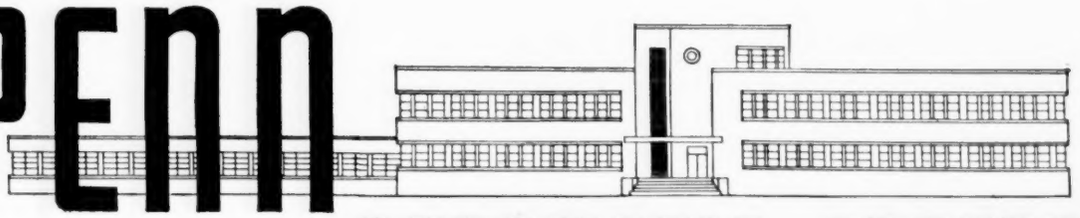
SWITCH TO *Penn* FOR DEPENDABILITY

Precision built for accuracy and long life, Penn automatic controls deliver the dependable service which satisfies your customers, protects your profits. There are Penn Controls for various types of heating, air conditioning and refrigeration applications.

Featured in the air conditioning and refrigeration line is the new 270 Series Penn Control, the first and only one in these fields to have a load-carrying two-pole switch. The 270 is versatile as well as dependable—it can control multiple refrigeration systems, two separate load circuits and (where protection is provided against single phasing) it controls polyphase motors of 3 h. p. and under without the use of line starters.

Switch to Penn for the satisfaction and profit opportunity which comes with dependable control performance. Ask your wholesaler for information on Penn's complete line of automatic controls or write to **Penn Electric Switch Co., Goshen, Indiana.** Export Division: 13 E. 40th St., New York 16, U.S.A. In Canada, Penn Controls, Ltd., Toronto, Ontario.

PENN



AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, ENGINES, PUMPS AND AIR COMPRESSORS

BONUS for the BOSS

From Customers and Employees

Unique, years-ahead features of beautifully styled Gemco "Packaged" Air Conditioners keep air so Cool, Clean, and comfortable that Customers and Employees return the modest cost in more and better work... and patronage!

LESS WEIGHT—Easy installation. Strong aluminum alloy 2-stage compressor helps save 450 pounds.

LESS WATER—Saves up to 50%. Gemco can be installed where water is warm, scarce, or expensive.

LESS NOISE—No knocking or pounding. Gemco compresses refrigerant not once, but twice, in two easy stages.

LESS UPKEEP—Motor cooled with refrigerant (a Gemco exclusive) lasts longer.

MORE PROFIT—No hot weather slumps. Gemco gives work-and-sales-stimulating climate when it's sweltering out-of-doors.

NO VIBRATION!—Try this 5¢ Test: Balance a nickel on edge on a Gemco compressor. Start and stop the motor. The coin stands . . . no vibration to run up service costs and wear out machinery. Visit your Gemco dealer. Make the 5¢ Vibration Test yourself. Then get a free estimate on Gemco Air Conditioning for your plant, shop or offices. Don't wait! ***This is the installing season!***

This ad . . . This month

IS SELLING GEMCO

Air Conditioning

FOR GEMCO DEALERS

And Building Prospect Lists

Investigate This Profitable Gemco Line!

A few excellent territories are still open. Wire or write for information on the valuable Gemco Franchise.

Remember, too—Gemco Dealers automatically become dealers for MIRACULA, the Heat Pump that caused a sensation at the recent Air Conditioning Exposition in Cleveland and the Heating and Ventilating Exposition in New York. Dealers are now making pilot installations in preparation for the volume market in 1949.

Gemco

AIR-CONDITIONING

GENERAL ENGINEERING & MANUFACTURING CO.

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Precision Manufacturers for 31 Years

NOW GET THE INSIDE STORY

Free folder reveals many revolutionary Gemco features

Also FREE: "The Earth Can Heat and Cool Your Home"

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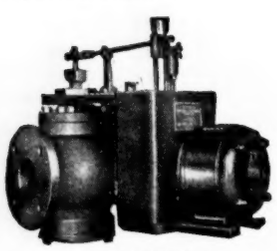
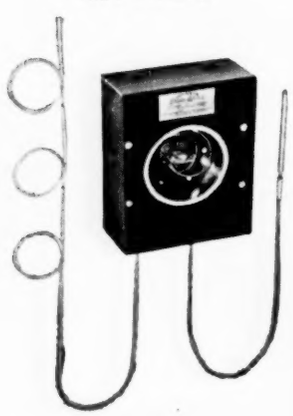
Steam and Fluid Control Equipment

MAJESTIC RADIO AND TELEVISION CORPORATION, Elgin, Illinois
A. Epstein & Sons, Inc., Chicago, Engineers • A. J. Ironsides, Elgin, Heating Contractor

Type E-4 Valve



Type T Valve



Type E Duostat

ILLINOIS Control Systems Type E

An Illinois Type E Standard Vacuum Zone Control System assures heating comfort, fuel economy and convenience of operation in this modern daylight factory. The system is divided into four heating zones . . . two in the Administration Building and two in the Plant Offices, such as Test Room, Cafeteria, Hospital, and Personnel. Steam is generated in two high pressure boilers at 150 pounds pressure. Illinois Pressure Regulating Valves reduce this to an intermediate pressure of 70 pounds for transmission, and further down to 3 or 4 pounds operating pressure at the various stations. All radiation in the controlled sections is of the convector type. Motor operated valves . . . one located at each zone station . . . are operated by outdoor-indoor controllers and are of the cycling control type.

●

Other ILLINOIS Heating Systems include Type A Continuous Flow Control and Type C Generation Control, as well as the Standard Vacuum and Vapor Systems.

Write for bulletins

ILLINOIS ENGINEERING COMPANY

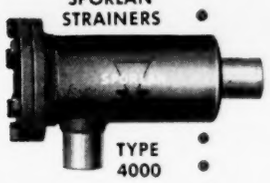
INCORPORATED 1900

RACINE AVENUE AT 21ST STREET • CHICAGO 8

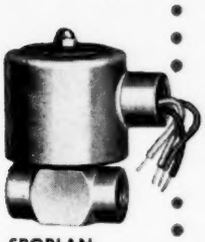
FOR PEAK PERFORMANCE in new installations use SPORLAN throughout!

SPORLAN CATCH-ALLS
1/3 Ton, 1/2 Ton
1 Ton

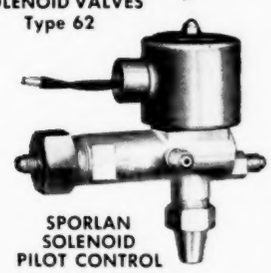
SPORLAN STRAINERS



TYPE 4000



SPORLAN SOLENOID VALVES
Type 62



SPORLAN SOLENOID PILOT CONTROL

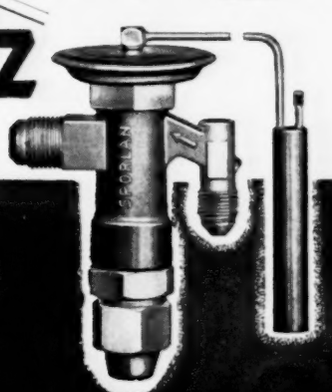
There is only one style and size..will out-perform any regular solenoid valve over 10 tons capacity . . . costs less..cheaper to install

With a complete line of Catch-Alls... Solenoid Valves...Thermostatic Expansion Valves ...Refrigerant Distributors and Strainers to choose from, you can order Sporlan products throughout for any commercial refrigeration or air conditioning installations you have in '48, direct from your wholesaler. He also carries the famous Sporlan Solenoid Pilot Control, which will save you money 3 ways on any job requiring solenoid valves larger than 10 tons. See him at once and learn what peak performance really means when you use Sporlan throughout.

Remember, too...

that only SPORLAN offers you Thermostatic Expansion Valves with Selective Charges

Type "G" SPORLAN THERMOSTATIC EXPANSION VALVES with Selective Charges
SPORLAN "C" CHARGE
for suction temperatures ABOVE zero
SPORLAN "Z" CHARGE
for suction temperatures BELOW zero



The complete line of SPORLAN PRODUCTS

SPORLAN VALVE COMPANY

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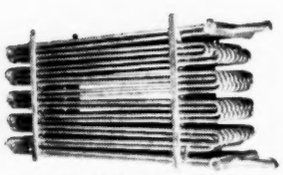
ACME

OFFERS A DECIDEDLY SUPERIOR

Evaporative Condenser

Double-Fan Model with front panel removed to show baffle plate which protects housing against corrosion.

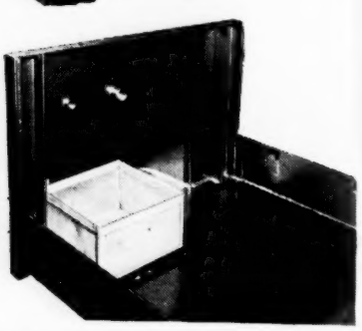


ALL PRIME SURFACE COILS . .
. . easy to clean

QUIET, EFFICIENT FAN ASSEMBLY

NON-CLOGGING
SPRAY NOZZLES

DRIP PROOF
WATER PUMP



BASE SUMP . . equipped
with WATER CONDITIONER

**WRITE FOR
NEW CATALOG
NO. 527**

vaporative Condensers are subject to corrosive action. Acme now offers new models that retard corrosion.

Heavier gauge metal is chemically treated for durability before painting. Casing and fan surfaces are sprayed with three coats of metallic chlorinated rubber finish—a finish that stands up under most exacting tests including salt spray and high humidity.

A steel baffle plate is installed between coil section and outside housing—assuring longer life. Fans and fan housing are specially finished for years of service.

Facilities for threshold water treatment. All parts easily accessible for service. A complete line for both FREON and Ammonia.

ACME INDUSTRIES, INC.
JACKSON, MICHIGAN

Evaporative Condensers • Dry-Ex Water Chillers • Freon and Ammonia Condensers • Shell and Coil Condensers • Pipe Coils • Industrial Unit Coolers • Heat Exchangers • Oil Separators • Liquid Receivers

READILY ACCESSIBLE ELIMINATOR

CONTINUOUSLY SERVING THE REFRIGERATION INDUSTRY SINCE 1919

Washington News

LORING F. OVERMAN

"STRIKING" is the only appropriate designation for March developments—printwise, coalwise, meatwise, and with respect to affairs centering in Washington.

Not since Pearl Harbor has Washington experienced a more shaking event than the President's appearance before Congress. And not since Pearl Harbor has an event promised to spark such widespread after-effects. In summary:

WAR? Last month folks were saying it just couldn't happen, not again, so soon. Today, informed Washington is still hopeful, but none too confident. And with Pearl Harbor not entirely forgotten, Washington appears to be nearing the decision to be somewhat more ready this time—just in case. Consequently:

MILITARY PREPARATIONS, including some form of mobilization and all of the purchases incidental to training and combat, face the orange light. There will be some dragging of Congressional feet, but the concensus appears to be that the country dare not run the risk of unpreparedness again. Purchase programs, particularly for aircraft, seem likely to get the first green light. Limited Selective Service could come next.

BUSINESS CONTROLS, probably partial in name, but overall in effect, would be the next step. Example: the Department of Commerce program of voluntary steel allocations sought under authority of the Taft-Wolcott anti-inflation bill. Considered, it is reported, are five steel allocation programs which, if completed, will have brought 30% of the finished steel capacity of the country under control by sometime in the third or fourth quarter of this year. Involved are programs to produce 14,000 freight cars per month, to increase petroleum industry capacity; also housing and farm equipment, and to double steel shipments to Europe.

Under such partial allocations, it is not hard to visualize the scramble that would take place among other industries not among the favored five. In the Department of Commerce it is freely predicted that if as much as 20 to 30% of steel is brought under control, it will be necessary to bring 100% under control to protect the rest of the economy.

STOCKPILING must also be considered as a possible additional bidder for such strategic materials as oil, tin, rubber and other vital categories. The President's Budget Message request for $360 million for stock-piling—action on which was deferred by the House Appropriations Committee—must be dusted off in the light of new developments.

SHORTAGES may continue to be taken for granted as the year progresses. Unless the Kremlin develops a change of heart—a most unlikely speculation—Uncle Sam is in the market again until further notice. To the $5.3 billion worth of things needed for the virtually-assured Marshall plan, add Uncle Sam's military purchases on his own account, and probably on account for half a dozen other nations. For a renewal, in principle, of military lend-lease is again in the picture as a distinct possibility—and the end is not in sight until a real, honest-to-goodness peace is much closer than it appears today.

Things Domestic

With foreign aid and military preparations claiming the Washington spotlight, otherwise significant happenings here play only the afterbeats. There are those who suspect, and hope, that the current international bonfire may be only a flare, placed to draw attention from politics during the months immediately preceding the national party conventions in Philadelphia, in June and July. But since no one can be sure, few chins are out. Congress is even wondering whether it will be able to adjourn prior to mid-June; therefore, how to get home and mend political fences. Meanwhile, Congress is trying to keep up the general appearance of business as usual.

Housing

In the housing field, for example, the perennial Taft-Ellender-Wagner bill (S.866) faces a Senate floor attack from several angles, particularly because it contains a controversial provision authorizing Government construction of 500,000 units of low-rent housing. Also, several of its provisions are considered outmoded, but corrective amendments have been introduced by Senator Flanders to incorporate recommendations of a Joint Congressional Housing Committee which conducted hearings from coast to coast last summer. This bill includes the public housing feature.

Dissident member of the Joint Committee is Senator McCarthy, who has introduced his own bill (S.2317), similar in scope to the original bill, but leaving construction of low cost rental units in the hands of private industry. Senator McCarthy contends that the public housing proposal should be considered separately, since its inclusion in the T-E-W bill makes a political football of the entire project, threatening passage of the less controversial features generally conceded to be desirable in a long range housing program.

Indications are that the T-E-W Bill will be the one that reaches the Senate floor, where a headon collision with the volatile McCarthy is certain. Should it survive that impact it will pass to the House Banking Committee, which has heretofore opposed public housing. In both Houses the bill will face new conditions imposed by the foreign aid and military programs—the appropriations question. Cost of the Housing project has been estimated at $4 billion.

Building Statistics

Another possible casualty threatening as the result of the tendency to foreign relations programs over

Put fresh air

Detroit Coca-Cola Bottling Plant, designed by Giffels and Vallet, Inc., L. Rossetti, Associated Engineers and Architects.

in business

with this modern fan

The new Ventura Fan, shown at right, is just one of the many American Blower air handling products designed to put better air in every business at reasonable cost.

For over 67 years, American Blower has pioneered the research, design and fabrication of air handling equipment.

Today, American Blower offers the most complete line of air handling products in the world. Many of these products, which were custom-made to order only a few years back, are now standard. This means big savings and off-the-shelf delivery.

When you want technical data on air handling, heating, cooling or drying equipment, write or call our nearest Branch Office—located in 57 principal cities in the U. S. and Canada.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

NEW VENTURA FAN for modern commercial and industrial establishments. Smartly styled—no exposed wiring—dependable.

AMERICAN BLOWER

those domestic, is the housing statistical activities of the Bureau of Labor Statistics. The House recently slashed operating funds of BLS 40% on top of an earlier reduction of nearly that amount.

"Construction statistics are more important than ever before, and what is needed is an increase in funds for this work, rather than a decrease," Congress was told on March 20 by Frank W. Cortright, executive vice-President of the National Association of Home Builders. "There is so much propaganda about housing and so many inaccurate sources of information that, without BLS, the public could be told anything by anybody."

Chairman Gamble of the Joint Congressional Committee on Housing told the House group considering the BLS appropriation request he is "in favor of cutting the Federal budget to the bone, but I regret a further cut in the budget of the Bureau of Labor Statistics at this time. My committee has found that the bureau's reports are universally regarded as accurate, impartial, and significant."

Gas Pipe Line

Texas Eastern Transmission Corp. asked the Federal Power Commission on March 12 for permission to build a 26-inch gas pipeline alongside its Big Inch line, 1020 miles from Longview, Texas, to Wind Ridge, Pa. Estimated cost is $152 million. The company said the new facilities would increase the sales capacity of its pipeline system by 933 million cubic feet a day. Construction would start as soon as steel and other supplies become available.

More About Steel

Since the progress of the heating, ventilating and air-conditioning industries is so dependent upon steel, it may prove interesting to examine further the status of the "voluntary allocation" program summarized briefly earlier in this column.

To date the only voluntary allocation project now in operation is the freight car program. This was started last year by ODT pressure, and is taking, on the basis of 10,000 cars a month, about 3 million tons of steel a year out of the open market. On March 15, hearings were held in Washington to consider stepping up the program to 14,000 cars monthly, requiring an additional 1,200,000 tons.

The petroleum industry currently is taking about 3 1/3 million tons of steel a year, the housing industry about 1 million tons, and farm equipment about 1¼ million. These four programs, without benefit of any increase such as is contemplated in the voluntary programs, are taking a total of 8½ million tons, or about 14% of steel capacity. An increase of 3 to 4 million tons has been mentioned as a possibility.

The export program, already under control is running at an annual rate of 6½ million tons a year—with Europe getting approximately 2 million tons, and needing 2 million more. Adding this to the four domestic programs in operation or proposed, would raise the total potential controlled steel tonnage to 21-22 million tons, or about one-third of the finished steel capacity of the United States in 1947.

Possible bright spot in the picture is that the farm equipment industry has indicated it is getting all the steel it can use without assistance, and others scheduled for favored treatment may feel the same. Conversely, if the military is to preempt supplies to any great extent, the farm boys may decide to climb back on the wagon.

The petroleum industry is not expected to be so modest. At the request of the Interior Department, it is preparing a year-and-a-half estimate of needs, foreign and domestic, which is expected to total high.

The five programs previously mentioned, the Department of Commerce is reported to have eight other programs under study involving power generating equipment, electrical machinery, coal processing and extractive equipment, steel oxygen reduction equipment, chemicals and chemical production equipment, non-ferrous metals, military, and maritime programs.

Inasmuch as these projects originate within Government—five of them in advance of the present war conversations—there are those who see in the whole activity a plot to have the steel industry and its customers embroiled in an unworkable series of crisscrossing "voluntary allocation" programs that will have industry tied in knots by election time. Some trade associations representing "favored" industries have urged members to move slowly in becoming beneficiaries of the plans. Significantly, the authority under which the partial allocation projects are implemented is a Republican measure, the Taft-Wolcott Anti-Inflation bill. Those who oppose the partial controls that could lead to full control of steel observe that Democratic political strategists may be planning to use the measure to embarass opponents rather than to implement production.

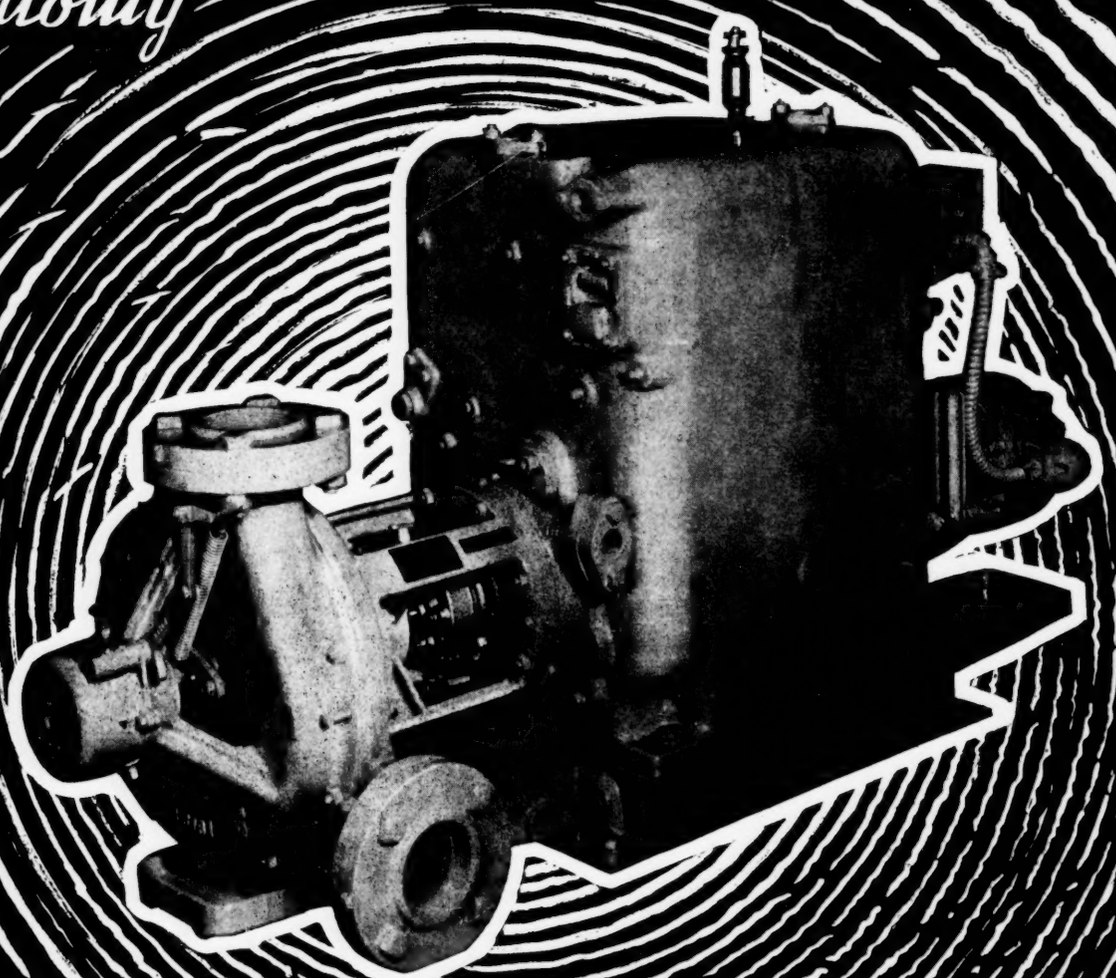
Synthetic Fuels Plant

Secretary of the Interior J. A. Krug announced on March 29 the award of a $4 million contract to Koppers Company, Inc., for the design and construction of a gas synthesis demonstration plant near Louisiana, Mo., to produce oil from coal.

This is the third and last of the demonstration or semi-commercial scale plants planned under the synthetic liquid fuels research and development program of the Bureau of Mines. Construction will begin within three months and it is hoped that the plant will be completed within 15 months after work begins. It will have a capacity of 80 barrels of oil and gasoline daily and will include a coal gasification unit. The gas synthesis plant will be erected adjacent to the Bureau's hydrogenation demonstration plant now under construction on the site of the Missouri Ordnance Works, a wartime synthetic ammonia plant. The 200-barrel-a-day hydrogenation plant is expected to be completed next summer.

The contract provides that the Koppers Company, at its own option, may sub-contract the following items or classifications of work: pipe and apparatus covering, sheeting, structural steel detail drawings, excavation and grading, roofing (composition) Dowtherm vaporizers, cooling tower, and gas preheaters.

Centralized Heating Economy



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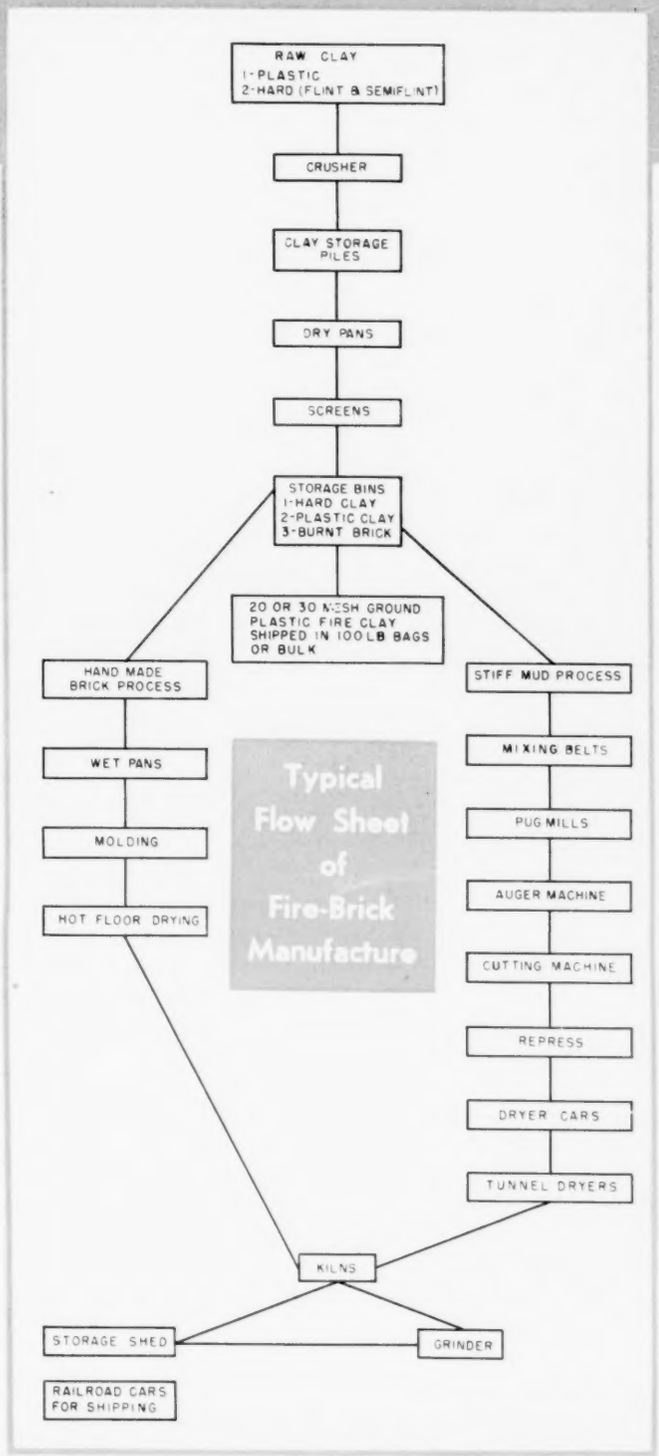
THE NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.

Control of Atmospheric Dust in the Fire-Brick Industry

W. W. Stalker
N. E. Scholl
R. S. Kneisel



THE problem of silicious dust exposures in the fire brick industry of Kentucky was investigated and reported in 1945.* This investigation disclosed a positive need for dust control in certain operations and processes which was not only essential from the health standpoint, but was a prerequisite to good housekeeping in general and often to sound and more economical production methods. Thus, in one plant the installation of an efficient dust collecting system in the burnt brick grinding department made it possible to salvage enough useable grinding dust to defray the expense of the entire installation within a two-year operating period.

Data, on the progress made in controlling atmospheric dust in three of the four plants originally investigated, are presented.

Because the production of atmospheric dust is so intimately connected with the various operations and processes in this industry, any dust control program must presuppose some knowledge of the over-all manufacturing process. The following description, with the accompanying typical flow sheet, should be sufficient to acquaint the reader with the general steps in the manufacture of fire brick. The average dust concentration in million particles per cubic foot as found before control was inaugurated is included with the description of the respective operations.

Receiving and Storing Raw Materials

The fire clay is shipped principally by rail from the mines to the factory. Upon reaching the factory site, the clay is handled in one of two ways, depending upon the common practice of the plant and the comparative purity of the clay.

(1) Unloaded directly into a crusher (or breaker)

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*Stalker, William W.: Silicious Exposures in the Fire Brick Industry; Journal of Industrial Hygiene and Toxicology, Vol. 27, No. 10, December, 1945.

Table 1—Dust Concentrations Before and After Control in Million Particles per Cubic Foot

Plant and Operation	Dry Pan		Screen Mill		Hot Floor		Machine Mold		Brick Grind		Mixing Room		Dirt Buggy*	
	Before Control	After Control	Before Control	After Control	Before Control	After Control	Before Control	After Control	Before Control	After Control	Before Control	After Control	Before Control	After Control
Minimum														
Plant 1	87	4.8	63.6	8.8	4.2	6.1	7.5	..	18.3	...	....	....	24.4	41.3
Plant 2	108.6	8.9	597	16.1	8.1	5.0	16.8	2.6	29.2	11.8	....	....	...	...
Plant 3	141.6	21.4	130.4	46.8	7.8	3.4	7.8	..	11.2	...	444	403.2	...	...
Maximum														
Plant 1	129	88.9	78	140.0	17.2	6.1	12	..	59.4	....	....	....	402.4	103.7
Plant 2	2742.2	200.8	791.1	54.0	187.5	14.3	20.4	9.4	84.5	68.9	....	....	...	...
Plant 3	387	192.0	597	46.8	26.4	3.4	13	..	28	...	514.8	511.2	...	...
Average														
Plant 1	108.1	36.1	70.5	44.8	10.6	6.1	9.8	..	54.9	...	....	....	153.5	72.5
Plant 2	1735.2	79.4	673.4	31.6	64.7	9.7	18.8	6.0	54.4	34.4	....	....	...	...
Plant 3	199.7	116.7	350.5	46.8	16.0	3.4	10.3	..	19.5	...	481.9	457.2	...	...
Total Combined Average	581	77.4	372.6	41.1	26	6.4	13.5	6.0	39.6	34.4	481.9	457.2	153.5	72.5
No. of Samples	13	16	20	11	20	4	10	2	15	6	7	3	5	2

*These operations have had only slight adjustments since the "Before Control" counts were made. As indicated by the later counts, control is still inadequate.

pan where the clay is subjected to a preliminary crushing. (10.2 million parts per cu ft.)

(2) Unloaded onto open clay piles where it is exposed to the weather for a variable period—often one year.

Grinding and Screening to Size

From either the crusher pan or open storage piles, the clay is brought into a dry pan mill by conveyor belts or wheelbarrows. The various grades of clays, including rejected burnt brick, are ground separately in the dry pan. From this mill the ground clay or brick is conveyed up to the screens, which are usually located at the top of the dry pan mill house. The screening is adjusted to the requirements of the particular product and generally ranges from 6 to 30 mesh. Finer material then passes through the screen and by way of chutes to storage bins, while coarser material is returned to the dry pan for further size reduction. (grinding = 581 mppcf; screening = 372.6 mppcf)

Mixing and Molding Clay

At this point a division may be noted in the flow of production. Thus, the clays are generally mixed by one of two methods depending upon which of the following products is desired.

Hand Molded Forms—Soft Mud Process. For the larger and special shaped forms, weighed amounts of ground clay and burnt brick are either hauled from the storage bins by dirt buggies, wheelbarrows, etc., or fed by gravity to a wet pan, where they are mixed with water to the consistency of mud. This soft mud mass is then pressed into molds either by hand or by a power-driven soft mud brick machine. Both methods are usually employed in each plant—the older hand method being reserved for large and special shaped forms. The machine has a capacity of 1,000 to 5,000 bricks per hour and is used in making the standard size bricks. Conveyor belt dry clay mixing method in Plant No. 3 = 481 mppcf; dirt buggy dry clay mixing method in Plant No. 1 = 153 mppcf.

Machine Mold Forms—Stiff Mud Process. Specified amounts of ground clay and burnt brick are emptied from the bins onto mixing belts, which convey the mixture to a plug mill. In this mill the dry clay is mixed with water and tempered. The mud is now soft enough to be squeezed through a die under pressure but is much stiffer and contains less water than the soft mud previously mentioned. The "pugged" clay is now fed into an auger machine wherein it is usually de-aired and then forced through a die. Coming out of the die in the form of a bar whose cross sectional dimensions are equal to a standard brick face, the stiff mud moves along a belt conveyor onto a cutting table where the bar is automatically cut into bricks. From here the stiff mud bricks go through a repressing machine where they receive true shape and dimensions. (Pug Mill = 25 mppcf).

Some of the plants employ still another method, known as the dry-press process for making machine molded bricks. Here the dry clay, usually containing less than 15% moisture, is fed from overhead bins or belts into the press hopper through several canvas tubes. As the machine operates, the charger moves over the mold to fill it and then withdraws. Top and bottom plungers then move toward each other in the

mold, thus subjecting the clay to a great pressure and finally forming a very compact brick.

Drying Bricks

Hand Molded Forms. The larger and special shaped forms, after being molded, are set on a concrete floor, called a Hot or Dry Floor, where they are allowed to dry out very slowly. This floor is often laid on top of a series of drying ovens which furnish an economical source of heat. In other cases, heat is supplied by steam pipes which run underneath the floor. (Hot Floor = 26 mppcf).

Machine Molded Forms. As the stiff mud and dry press bricks come off the machines, they are placed directly onto dryer cars and are moved into long tunnel dryers. In these tunnels the moist bricks are exposed to a carefully controlled atmosphere (temperature, humidity, and air movement). The loaded cars are pushed into the tunnels on a predetermined schedule, so that for each car of moist bricks going into the tunnel, a car of dry bricks will leave it. (Machine Molder = 135. mppcf).

Setting and Firing Bricks

The dried bricks removed from the hot-floor and tunnel driers are then taken to the kiln-yard where they are properly set in the kilns. This job is handled by a group of four to six men known as the kiln setter gang. Coarse sand is usually spread on top of the rows of brick to prevent them from fusing with one another during burning. The kilns, which were either coal or gas fired, were of the circular down-draft and periodic types in all of the plants studied. However, one of the plants was converting to the more modern continuous- tunnel-type kiln and has discontinued the use of many of its periodic kilns before the study was completed. (Kiln setting = 16.3 mppcf).

Tearing Down and Cleaning Kilns

After a sufficient cooling period, bricks are removed from the kiln by the burnt gang or drawer gang, which consists of four to six men, namely, one tosser, two wheelers and one hacker. The Tosser removes the bricks from the top of the stack and tosses them to the Wheelers, who then haul the bricks in wheelbarrows to the storage room. Here the job of setting bricks in rows for storage is left to the Hacker. (29.2 mppcf).

Grinding, Storing and Shipping

Final trueing of brick surfaces is accomplished by grinding the bricks, mostly special sizes and blast furnace brick, to specified dimensions. Most plants employ double-disc Bridgeport grinders fitted with specially designed exhaust hoods for this purpose. The completed bricks are now placed either directly into freight cars for shipping or in storage sheds. (Burnt brick grinding = 39.6 mppcf).

In bag loading which is a periodic operation, fine ground plastic clay is loaded into 100 lb sacks directly from the storage bin chutes by two sackers who immediately prepare it for shipment. This operation is periodic (one or two weeks) and of short duration in most plants. (544 mppcf).

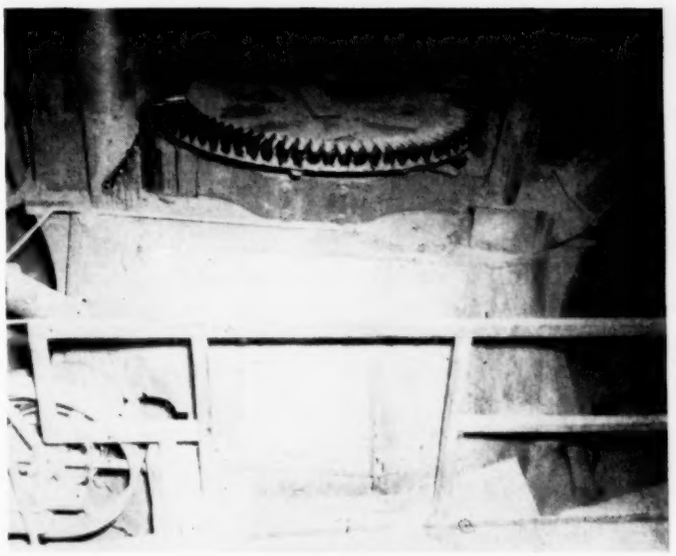


Fig. 1. Dry pan enclosed and exhausted.

Results and Discussion

It was a conclusion of the original dust study that the processes which produced the most, hazardous sustained concentrations of atmospheric dust (both total and free silica) were: Dry pan milling, screening, and clay mixing operations. Although other operations such as bag loading, dirt buggy loading, breaker pan, ball milling, and hot floor sweeping, produced temporary unsafe levels of dustiness, these operations were usually temporary or in semi-isolated locations and thus of secondary importance.

Since the most hazardous dust exposures in the industry were consistently found on the dry pan milling and screening operations, it has been the policy in each plant to first concentrate upon the control of these two operations. The results have been most encouraging in every case.

It will be noted by referring to Table 1 that the average atmospheric dust concentrations have been reduced from 581 to 73.6 mppcf (approximately eight times) in dry pan milling and from 372.6 to 45.2 mppcf (more than eight times) in screening. The full significance of controlling these two operations is not apparent until it is realized that the dust from dry pan, screen mills, and associated clay storage procedures are major contributors to the cross contamination of the main working atmosphere in most fire brick plants. Thus in two of the three plants included in the present study, the dry pan and screen milling departments adjoin the main molding floors and have several openings into the main working areas.

Dry Pan Mill

While the respective dust collecting systems in the three plants vary in many respects, the principle of enclosing and exhausting the dry pan is a common practice in all of the plants. The general method of enclosing the average 9 ft dry pan can best be understood by referring to Fig. 1 and then noting dimensions and description of the enclosure in Table 2. An access opening large enough to permit the entrance

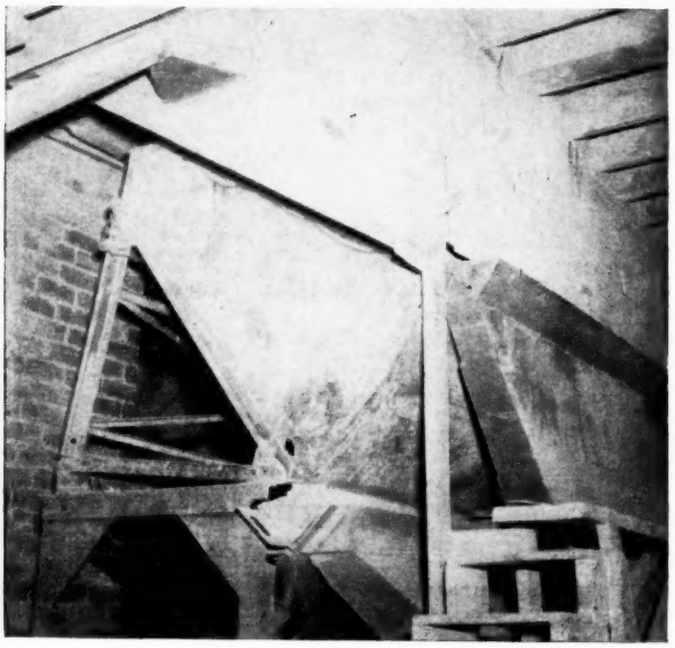


Fig. 2. Screen mill shakers enclosed and exhausted.

of maintenance workers is included in each enclosure. The doors on these openings nearly always remain closed while the dry pan is running.

A most important factor in attaining effective dust control at the dry pans is the feet per minute maintained at all outside pan openings. The minimal exhaust velocity originally recommended for all openings into the pan was 300 fpm. It will be noted in Table 2 that only Plant No. 2 approaches this velocity and consequently, this plant has reduced its average dust concentration at the dry pan more than twenty-one times as compared with reductions of three times or less at the other two plants. See Table 1. This additional dust reduction in Plant No. 2 would be, at least partly expected however in that the original atmospheric dust load was far greater at the dry pan in this plant than at similar operations in the other two plants.

The fact that maximum dust concentrations, Table 1, as high as 200 mppcf have been found at the dry pans even since the installation of the enclosure-exhaust systems should not be overlooked. While these maximum dust counts may be assumed to be indicative of the worse possible conditions such as dry weather clay, temporarily overloaded dust collectors, etc., the exact number of times that such conditions might recur during the operating year would be unpredictable.

It appears, therefore, most important that the maximum possible dust concentrations be reduced to the upper limit of safety which has been set at 50 mppcf.

The greatest single inadequacy noted in all dry pans studied has been that of intake velocities through the pan openings. Since a few openings are apparently unavoidable in dry pans, and since the openings occur at variable distances from the exhaust pipe entry, the maintenance of even air flow into the pan presents a most difficult problem in exhaust ventilation. The great range of these velocities are given in Table 2.

One obvious step in effecting a solution to the problem would be to increase present fan capacities. However, in view of economy at this point it would seem expedient to first subdivide the single exhaust duct in each case into a series of several branch pipes. These branch exhaust pipes might then be connected to the pan enclosure at points which correspond as nearly as possible to present pan openings.

Finally, it is most essential that the size of all pan openings be reduced to an absolute minimum in order to increase intake velocities to their highest attainable levels.

Screen Mill

The screen mill in each plant includes two shakers of approximately the same dimensions, 4 ft x 5 ft, The most striking reduction in atmospheric dust in a screen mill room was again noted in Plant No. 2 where the total average dust count was reduced 21 times after enclosing the two screen shakers. In this connection it is significant that Plant No. 2 has effected this much control by complete enclosure alone and without any exhaust ventilation whatsoever. While the limited number of atmospheric dust samples taken at this plant do not furnish conclusive evidence that enclosure alone is adequate control for slay screening, the findings certainly indicate the value of dust tight enclosures (preferably metal) around all shakers and screens.

Plant No. 1 has reduced atmospheric dust by completely enclosing the screens, Fig. 2, and applying a slight amount of suction at the rear of the enclosure. Periodically high dust counts obtained at this operation since the installation of the enclosure may be ascribed largely to leaks which have developed in the wooden enclosure.

Plant No. 3 has attained some control of screen mill dust by installing partial coverage canopy type hoods over the lower top side of the shakers and maintaining a slight suction of 15 to 20 fpm at the hood faces. This type of enclosure, however, could not be expected to afford adequate control when extremely dry clay was being screened and the conditions of operation at their worse.

Burnt Brick Grinding

The grinding of finished (fired) refractories is carried on rather extensively in one of the three plants studied. Since, however, the continuity of this operation is known to vary from a few hours to several days in various refractories plants, this operation might well assume significant proportions in its contribution to the over all dust picture in any one plant.

In Plant No. 2, Fig. 3, three double 30 in. Begley swing grinding wheels (carborundum resinoid-bonded type) are operated by a full time grinding gang throughout the day shift. The equivalent of about 1,800 regular 9 in. bricks are handled on these six wheels during the 8 hr period.

Table 2 – Description of Dry Pan Control

Plant Details	Plant 1	Plant 2	Plant 3
Total amount of material handled per day by both pans	West / East: 200-300 tons per day	180 tons per day	450 tons per day
Daily brick capacity (Approximately)	60,000	50,000	100,000
Location of dust collectors	About 3 floor heights above dry pan (45 ft)	About 1 floor height above dry pan (15 ft)	About 2 floor heights above dry pan (35 ft)
Number, type, and size of pans	2—9 ft Clearfields	2—9 ft Clearfields	East—9 ft Clearfield West—9 ft Chambers pressure dry pan
Description of enclosure	East / West: Complete enclosures	East / West: Modified enclosure	East / West: Complete enclosure
Size of enclosure	East / West: 6'1" x 12'6" x 12'6"	East / West: Base 10' dia., height 6.5'; top 6' dia.	East—10' x 10' x 12' West—10½'x11'2"x12'9"
No. of exhaust ducts per pan and size	East / West: 1 of 7" dia.	East / West: 1 of 10" dia.	East / West: 8" & 5" Branches tied into 8" main exhaust
Fpm at exhaust pipe entry	East—(No. 2) 2000 West—(No. 1) 2100	East—2700 West—3600	East—3800 West—1500
Cfm at exhaust pipe entry	No. 1—561 No. 2—534.6	East—1800 West—2470	East—1320 West—2500
Type dust collectors	Western Precipitation Co., Multi-Clone Dust Collector, Type 9, VD Model 116580	East—Sly No. 22 Collector West—Draco (Collector Type, Multibag 20s)	East—Sly West—Sly
Ranges, fpm, at intake openings of pans	25-50 fpm	85-400 fpm	25-50 fpm

The wheels are mounted in series of two and are equipped with hoods which are exhausted through 8 in. pipes as shown in Fig. 3. These 8 in. pipes are in turn connected to 10 in. vertical ducts which are finally angled into a main duct. The main duct leads to a Sly filter-bag type dust collector located outside of the grinding room. One American Blower exhaust fan rated at 8630 cfm, connected down stream to the collector, furnishes the source of suction for the entire system.

The exhaust velocities at the face of each grinding wheel hood varies from 1,200 to 4,000 fpm and the total volume exhausted through each hood ranges from 900 to 1,000 cfm.

Although the present average dust concentration of 34.4 mppcf at the grinding operations is considered within the limits of safety, there is every reason to believe that minor revisions in the design of the present hoods will result in the capture of at least one-half the dust now escaping into the atmosphere.

Conclusions

By concentrating upon control of the two greatest dust producing operations, dry pan mills and screen mills, the fire brick industry has made much progress during the last two years toward solving a general and potentially hazardous dust problem. As a result of this progress, a reduction in concentration of atmospheric dust has been evidenced not only in the immediate vicinity of the many operations but also throughout the entire main working areas in each plant.

Finally, in order to approach and maintain a state of completely adequate dust control in the industry a three-point program should be very definitely outlined in each plant.

(1) Continued improvement, repair and maintenance of all dry pan and screen mill enclosures and exhaust duct work with elimination of all unnecessary leaks in the entire grinding, screening, and accompanying clay storage systems is most essential.

(2) Install necessary dust controls on the various operations referred to as of secondary importance, e.g. bag loading, dirt buggy loading, breaker pan, ball milling, and hot floor sweeping.

(3) Adopt a sustained program of good housekeeping initiating the program by thoroughly cleaning the plant of all settled and accumulated dust.

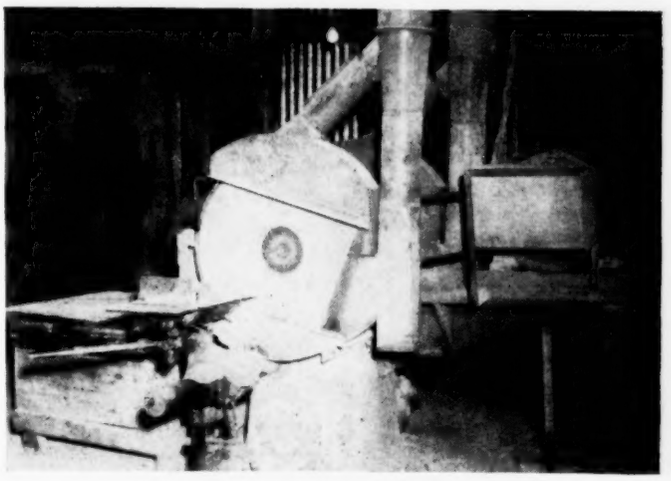


Fig. 3. Brick grinding wheel in operation. Wheel is hooded and exhausted.

Effect of Support on the Performance of Vane Anemometers

G. B. SCHUBAUER and G. H. ADAMS
National Bureau of Standards

One of the more important factors affecting the accuracy of a measurement of air speed with a vane anemometer is the manner in which the instrument is supported. An awareness of this fact is important since the user must devise his own support. It is shown in this article that seemingly minor changes in the support may change the indicated speed by 5% and that holding an anemometer in the hand may increase the indicated speed by as much as 17%. In order to insure the reliability of a speed measurement, an interference-free type of support is recommended.

THE accurate measurement of air speed with a vane anemometer depends on an accurate calibration and on conforming strictly to the conditions for which the calibration will be valid. These conditions involve primarily the manner in which the anemometer is supported.

For many years calibrations were conducted at the National Bureau of Standards[2] by means of a whirling arm, a device which moves the instrument along a circular path through the air at constant speed. The instrument was simply fastened to a flat plate at the end of the arm as shown in Fig. 1, and the arm was rotated at a series of known rates. The accuracy of a calibration by this method was limited by the so called "swirl correction," a necessary but rather uncertain correction applied to the peripheral speed of the arm to take account of the rotation of the air in the room produced by the rotating arm.

In June 1947 it was decided to conduct all calibrations of vane anemometers in the wind tunnel where absolute speed measurements could be based entirely on the standard pitot-static tube. In making the change to the wind tunnel, the question of the proper means of supporting an anemometer was brought to the fore. It was already known that the support could affect the rate of an instrument and that the best way to avoid possible error was to use the same type of support at all times. The flat plate, formerly used with the whirling arm, could be defended only on the grounds that manufacturers in failing to supply a supporting member of any sort presumably left the user free to adopt any support that suited his convenience—even to holding the anemometer in his hand. To throw some light on the importance of this question, it was decided to investigate the performance of several sizes of vane anemometers of the type shown in Fig. 1 to 5 on the various types of support shown in the figures. The investigation was conducted in the Bureau's 4½-ft wind tunnel.

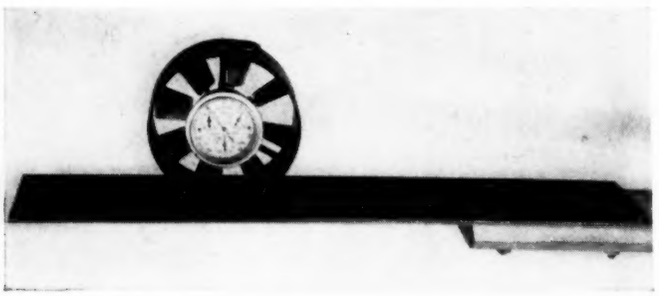


Fig. 1. Anemometer supported on flat plate.

Interference-free Mounting

If an anemometer is suspended in a wind stream on wires so fine that they are incapable of producing interference, a performance free from support interference may be obtained. By comparing the performance obtained in this way with that obtained on the rod-type of support shown in Fig. 2, it has been found that a rod no greater than ½ in. in diameter produces no measurable interference when it extends directly downstream. Effects from members supporting the rod itself may be made negligible by placing them at a sufficient distance downstream. This requires a minimum distance of the order of 16 times the diameter or cross-stream width of such members. In the mounting shown in Fig. 2, ample margin has been allowed, and the mounting is interference free. The portion of the rod directly under the anemometer is flattened to about ⅛ in. in thickness. In the investigation of the interference produced by other types of support, the performance on the support in question was compared with that on the rod.

Fig. 2. Anemometer supported on rod.

Other Supports Investigated

The flat plate on which anemometers were mounted in the past for a whirling-arm test is shown in Fig. 1. A wooden member simulating the end of the arm is shown to the right. The plate is ⅛ in. thick and 3 in. wide. The distance from the end of the arm to the end of the plate is 12½ in. The wind moves normal to the face opposite the dial and parallel to the flat side of the plate.

The types of hand support shown in Fig. 3, 4, and 5 were chosen not as recommended methods of sup-

Fig. 3, Hand No. 1.

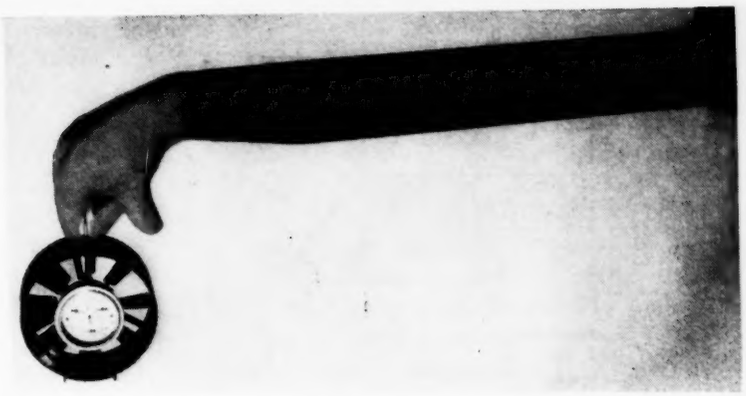


Fig. 4. Hand No. 2.

Fig. 5. Hand No. 3.

port, but rather as manners in which an observer might be inclined to hold an anemometer in making a measurement of air speed. The models are intended to represent approximately an adult hand and arm. The arm length is not intended to be correct, and the body is not represented. This would correspond to the case where the observer's body is completely outside the wind stream. Fig. 1 to 5 all show a 4-in. anemometer, the size referring to the inside diameter of the cylindrical housing.

Fig. 3, hand No. 1 shows one finger through the ring of the anemometer and two fingers supporting the housing. The arm extends to the side and is at right angles to the wind.

Fig. 4, hand No. 2, shows one finger through the ring allowing the anemometer to hang down freely. The arm is at right angles to the wind. The thumb is on the downstream side.

Fig. 5, hand No. 3, shows an anemometer being held by means of a short handle. The arm is directly downstream inclined at an angle of 45 degrees to the wind.

Results

Curves showing the performance of a 3-in., a 4-in., and a 6-in. anemometer are given in Fig. 6, 7 and 8 respectively.

The speed indicated by an anemometer depends on the rate of rotation of the vane wheel, which in turn depends on the setting of the vanes, the diameter of the wheel, the speed and direction of the air through

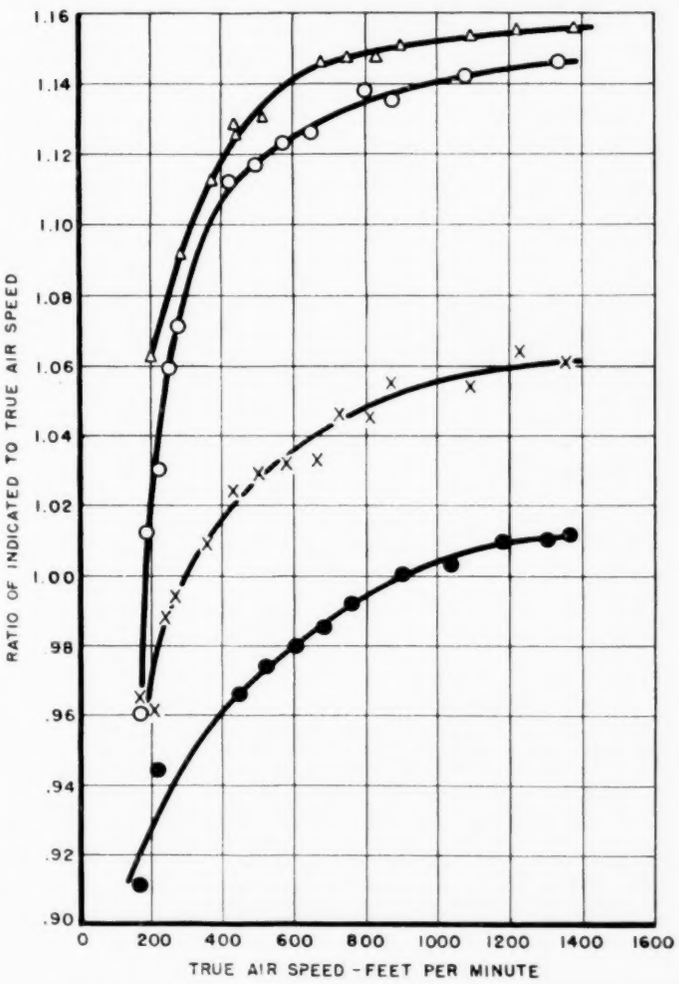


Fig. 6. Performance of 3-in., 8-vane anemometer. Δ, hand No. 2; 0, hand No. 3; ×, plate; •, rod.

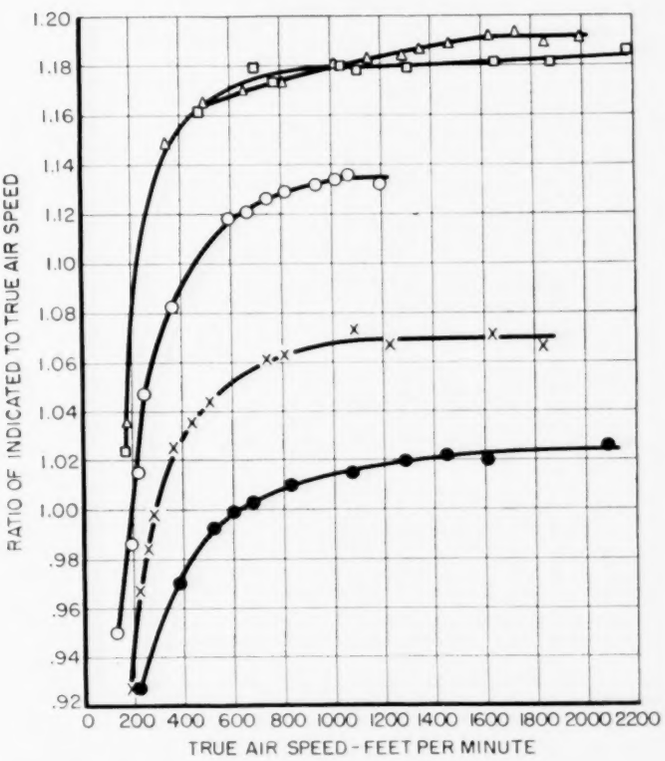


Fig. 7. Performance of 4-in., 8-vane anemometer. Δ, hand No. 2; □, hand No. 1; 0, hand No. 3; ×, plate; •, rod.

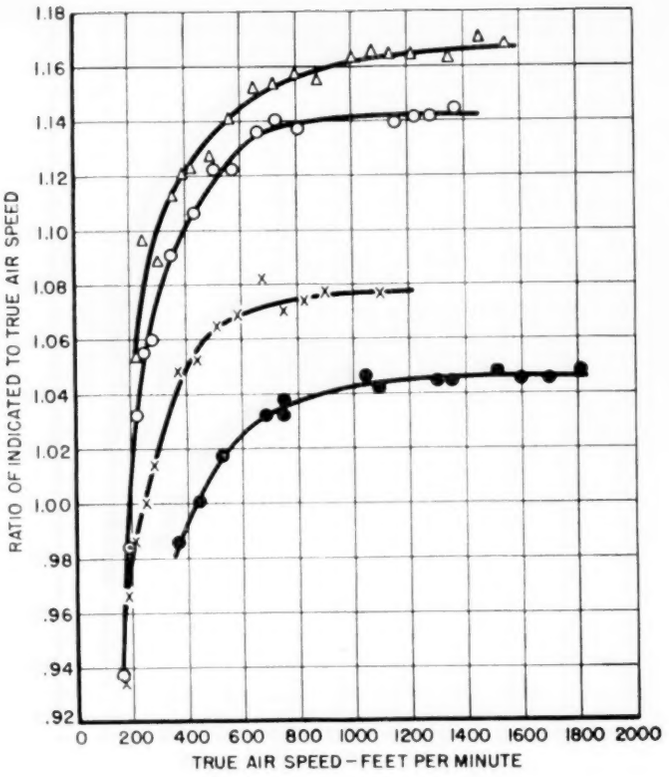


Fig. 8. Performance of 6-in., 10-vane anemometer. Δ, hand No. 2; 0, hand No. 3; ×, plate; •, rod.

the wheel, and the friction of the instrument. The true speed is the speed of a uniform parallel flow of air that would exist if the anemometer and its supports were absent. The indicated speed may be less than, equal to, or greater than the true speed depending on the factors that control the rate of rotation of the vane wheel.

The performance given in Fig. 6, 7, and 8 is in terms of the ratio of the indicated speed to the true speed plotted against the true speed. Displacement of the various curves from the curve showing performance of the rod-supported anemometer (solid dots) shows the altered performance due to the interference of the support. It will be noted that the ratio of indicated to true speed is increased in every case. The reason for this is that the air speed through the instrument increases locally due to the fact that the air must flow around the support.

The changes in indicated speed due to interference are given in Table 1 as percentages of the true speed at several values of the true speed. There is an indication that the percentages decrease slightly with increasing speed, but the change is scarcely outside the experimental error. The column of averages may therefore, be used as a reliable index of the various interference effects. It will be seen that the interference effects are about the same on the 3-in. and 4-in. anemometers, but somewhat less on the 6-in. anemometer. A decrease with increasing size is to be expected because the anemometer becomes larger relative to its support. Since hands No. 1 and No. 2 produced roughly the same effect, No. 1 was used only with the 4-in anemometer.

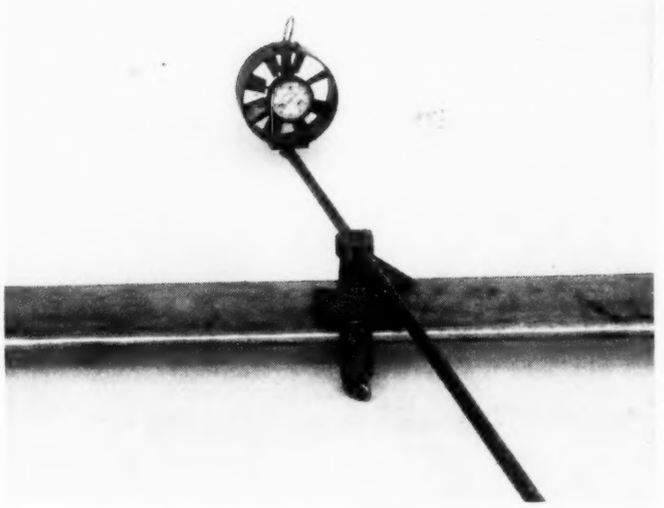


Fig. 9. Anemometer on rod clamped to strut.

All of the effects demonstrated here are large compared to the inherent accuracy of a calibration curve. The scatter of the points about any one mean curve in Fig. 6, 7, and 8 shows that a calibration curve is defined to an accuracy of better than 1%. However, there may be systematic errors in the measurement of speeds below 400 fpm amounting to several per cent, so that the scatter of observations is not a reliable indication of the absolute accuracy at the lower speeds. Nevertheless, interference effects are likely to be the major source of error unless the same support system is used at all times. The support therefore

Table 1 – Change in Indicated Speed Due to Interference, Expressed as Percentage of True Speed

Support	True Air Speed, fpm					Average
	400	600	800	1200	1600	
3-Inch Anemometer						
Rod	0	0	0	0	...	0
Plate	5.6	5.6	5.4	5.0	...	5.4
Hand No. 1	...	...	...	...	...	...
Hand No. 2	15.6	16.1	15.4	14.4	...	15.4
Hand No. 3	14.6	14.5	14.1	13.4	...	14.2
4-Inch Anemometer						
Rod	0	0	0	0	0	0
Plate	5.5	5.3	5.4	5.1	4.7	5.2
Hand No. 1	18.1	17.1	16.8	16.2	15.9	16.8
Hand No. 2	18.1	16.9	16.5	16.5	16.8	17.0
Hand No. 3	11.5	11.8	11.9	11.7	...	11.7
6-Inch Anemometer						
Rod	0	0	0	0	0	0
Plate	5.6	4.3	3.7	3.3	...	4.2
Hand No. 1	...	...	...	...	...	...
Hand No. 2	12.7	11.8	11.9	11.9	12.0	12.1
Hand No. 3	10.7	10.3	10.1	9.7	9.6	10.1

becomes in effect part of the instrument and changing it amounts to changing the instrument.

Not all interference effects will be as large as those shown here, for the effect depends entirely on the size, position and shape of the support. If the bulk of the support is to the rear of the anemometer the effect may be in the opposite direction. It is entirely possible that some disposition of the support may be made such that effects from the side and effects from the rear just cancel. However, proper balance might be difficult to obtain over the entire speed range of an instrument and, also, would be affected by wind direction. Directional effects on anemometers without support interference are treated by Roy H. Heald and Paul S. Ballif in Research Paper RP1056, Effect of Yaw on Vane Anemometers, National Bureau of Standards Journal of Research, December, 1937.

Possible Standard Mounting

In considering the question of a standard mounting it is helpful to keep in mind the fact that any mounting must be regarded as part of the instrument. Since an anemometer supplied by a manufacturer should be regarded as a complete instrument, it is assumed that nothing should be added to it. Therefore, since the rod support is equivalent aerodynamically to adding nothing, the rod support of Fig. 2 has been adopted for the purpose of calibration.

Experience with vane anemometers at the National Bureau of Standards has shown that it is possible to employ the rod support under nearly all conditions of use. Even when it is necessary to use a short rod the interference from the member holding the rod is likely to be small. According to Heald and Ballif, for example, the clamping device and strut shown in Fig. 9 had a negligible effect at distances downstream of one foot or more. Even at 4 in. the interference effect was only of the order of 1 or 2%. The strut in this case was 1¼ in. thick and 3 in. wide and extended completely across the tunnel.

Preheated Air Helps Carry Panel Load

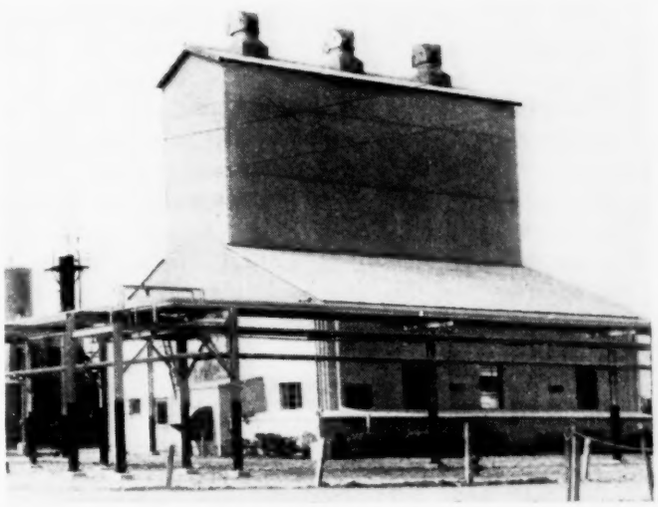
A unique heating and ventilating system is being used in Shell Chemical Corporation's new general experimental laboratory at Deer Park, near Houston, Texas. At present, the laboratory is being used only for distillation work. It also contains some office space. When all necessary equipment has been installed, the laboratory will be used to test scale model plant units in connection with development and improvement of various chemical processing operations, according to G. F. Johnson, Shell's chief chemist at Deer Park.

Primary system is radiant heating, consisting of wrought iron pipe coils buried in the 8-in. concrete floor. The radiant heating system in the floor minimizes fire and explosion hazards caused by exposed heating equipment in areas where combustible materials are handled. Due to the nature of operations in the structure, designers specified 60 air changes per hour. This means air must be removed at about 60,000 cfm.

Since no heating system could be expected to establish and maintain adequate temperatures during severe winter weather in a building from which air is removed at 60,000 cfm, it was deemed necessary to preheat replacement air.

Preheating is done by steam in a plenum chamber that extends along one side of the building. There are louvered openings from the plenum chamber into the laboratory. When the system operates, four 25,000 cfm roof fans will remove interior air while outside replacement air is drawn into the plenum chamber for heating before discharging into the laboratory. It is felt, however, that this auxiliary heat will not be required very often because of comparatively mild winter weather in the area.

The new building, 52 x 52 ft in size, is constructed of skeleton steel framework with glazed brick and Transite siding. There are one 10 x 12 ft door and three 3 x 7 ft doors. The few windows are fixed sash.



Exterior of Shell Chemical Corp.'s new laboratory at Houston, Texas. Three large ventilators on roof are to remove 60,000 cfm of air from the building. Plenum chamber extending along side of building is used to pre-heat replacement air. Design temperatures are maintained by radiant heating system buried in floor of building.

Although a one-story structure, it is extra high—more than 50 ft—in the central portion—an area 14 ft wide and 52 ft long. Rest of the building is 20 ft high.

There is no extra insulation between the metal and Transite roof. This increases the problem of maintaining proper temperatures at working level because of heat losses through the roof.

Because there was no requirement for high volume ventilating last winter, the radiant heating system alone was used.

The new laboratory was designed by Carl A. Mulvey, Houston architect, and the heating and ventilating system was designed by Dale S. Cooper and Associates, Houston consulting engineers.

Self-contained units for

Air Conditioning Multi-Story Buildings

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General Motors Corp.

Second of a series of articles covering some of the methods employed for air conditioning multi-story buildings. Article describes engineering and operating features of the unit system.

SELF-CONTAINED units have been used for a number of years to supply comfort and process air conditioning to both new and old multi-story buildings. Although there have been some limitations in their use for process applications and in new buildings designed for another type of system, they have proved to be valuable for comfort conditioning of existing buiidings. In this article only the latter application is considered, for in this there are no limitations.

When any type of air conditioning system is installed in a multi-story building, the following fundamentals must be included: Good air distribution, proper zoning, accurate control, sufficient ventilation, efficient air cleaning, large cooling capacity, adequate utilities, and optional winter operation.

Let us now consider the available sizes and details of self-contained units and also how they fulfill these requirements.

Self-contained units are available with capacities up to 30 tons, with the 3-, 5- and 10-ton sizes being the most popular. All sizes can be used with connecting duct work, but in most applications, the 3- and 5-ton units, Fig. 1, are used where the air can be distributed from grilles which are a part of the hood of the individual units. The 10-ton and larger units are usually installed remote to the conditioned area and the large amount of air delivered necessitates the use of connecting duct work for proper air distribution. The determination of what capacity unit to select depends on the amount of load, zoning desired, size and number of conditioned areas, location of utilities, owners preference, etc.

Air Distribution

It is a recognized fact that good air distribution is one of the most important assets of any air conditioning installation. Probably more complaints and dissatisfaction have developed due to lack of good air distribution than to any other factor.

Unit conditioners of 3- and 5-ton capacity are equipped in many cases with outlet grilles which have adjustable louvers which permit the air to be deflected in both the horizontal and vertical directions. This flexibility is very desirable for it provides a means of eliminating drafts and also obtaining good air distribution over the entire area.

The conditioning of adjoining areas is an application particularly well suited to the use of self-contained conditioners. Three- and 5-ton units have discharge grille openings available on all four sides which means that if these units are installed along a wall, the areas on both sides of the wall can be conditioned with very little or no duct work being required.

The quantity of air supplied by a self-contained conditioner is sufficient for an area having a cooling load which demands a unit of that capacity. Typical air quantities are 1,200 cfm for a 3-ton unit, 2,000 cfm for a 5-ton unit and 4,000 cfm for a unit having 10-ton capacity. The air is delivered at a velocity low enough to prevent objectionable air noise and also to provide draft-free air distribution.

When it is necessary to use duct work, the air velocity should not exceed 1,400 fpm for the average installation. The air distribution outlet, which is supplied by connecting duct work, is usually one of the following types: Grille, ceiling diffuser, or perforated

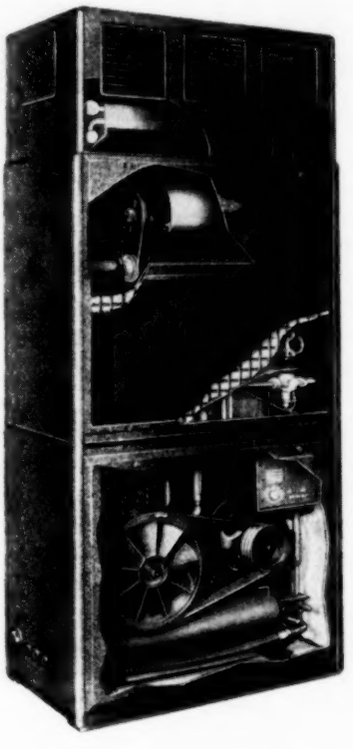


Fig. 1. Cutaway view of a Frigidaire package air conditioner.

ceiling. The price of the outlet and also the effectiveness in eliminating drafts increases in the order named. The installation of a perforated ceiling is especially practical whenever building or remodeling plans call for a new ceiling.

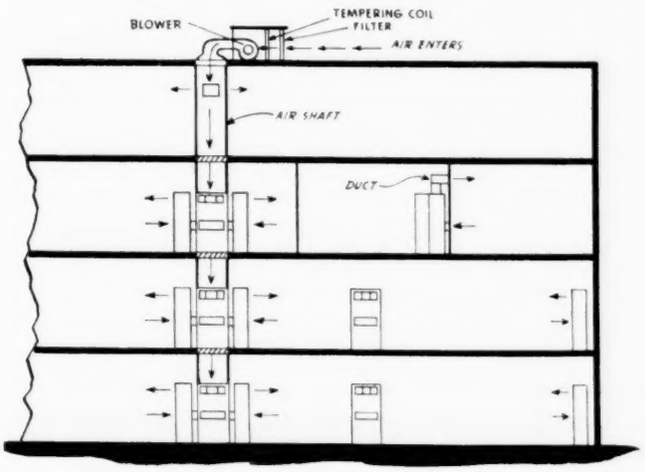


Fig. 2. Cross section view to show how the units are located adjacent to the ventilating shaft which also serves as a distribution center for the various utilities.

Air volume control is not recommended for a quality air conditioning installation. Its use, although providing some degree of temperature regulation, thoroughly upsets the air distribution, resulting in drafts and uneven temperatures in various parts of the room. If it is found necessary to use volume control, a perforated ceiling can probably be used with more success than the other types of outlets.

If the self-contained unit is in a remote location, provision should be made for returning air from the conditioned area to the self-contained unit. The path of this air can be through corridors, stairways or similar unobstructed passages. Care should be taken that air is not taken from or through kitchens, lavatories or other odoriferous areas.

Zoning

Zoning is included as a part of all quality air conditioning installations wherever the area to be conditioned is subject to varying internal or external loads. A good example of the need for zoning is found when an interior space and also one along an outside wall are to be conditioned. In this case, the space along the outside wall will require cooling in the summer and heating in the winter, while the interior space may require cooling all year. The exposure of outside walls adjacent to conditioned spaces also accentuates the need for zoning. For example, a conditioned space with a north exposure may require heating when a space that is provided with a different exposure requires cooling.

Zoning is obtained at no extra cost by the installation of a multiple unit system. Each self-contained conditioner has an individual thermostat, which feels any change in the conditioned area and immediately adjusts itself to handle the new changed or modified condition.

Controlling Temperatures

One of the prime functions of an air conditioning system is to control the temperature in a specified space. The most desirable system would be a separate control for each office with equipment to back up the demands of each control. This type of installation is both expensive and complicated if handled by any other system than with unit conditioners. By having the self-contained air conditioner installed, an occupant of the office may start or stop the air conditioning system according to his own desires.

Each self-contained unit has its own cooling thermostat which comes installed in the return air stream and is an inherent part of each conditioner. However, if so desired, the thermostat may be installed remote to the unit.

For summer conditioning, the thermostat controls the operation of the condensing unit and cooling coil in accord with the demands of the conditioned area. The self-contained unit is also equipped with a high pressure cutout switch which protects the compressor against excessive condensing pressures and the compressor motor from overload.

For winter conditioning a heating thermostat controls the operation of a motorized valve for a heating coil. The heating thermostat may be installed adjacent to the cooling thermostat or a combination thermostat may be used to replace the present control.

Where the air entering the heating coil may fall to freezing or below, a two-position control should be used. Where the air at all times will be above freezing a modulating control for the heating coil is recommended.

Ventilation of Room

The operating principle of ventilation is one of dilution, in which a portion of contaminated air is displaced by an equal amount of outside air. The correct amount of outside or ventilating air can be easily introduced by self-contained conditioners, usually accomplished by a duct to the outside or to a convenient air shaft. The use of a ventilating air shaft extending the height of the building has proven to be quite popular for it can be used for providing ventilation to unconditioned areas and can also be available if unit conditioners are installed later.

If a ventilating air shaft is used, it is considered good practice to install an auxiliary blower which draws air from the outside through a set of filters and a tempering coil before discharging it into the air shaft. If this is done, a sufficient supply of air is assured to all units on all floors regardless of the height of the building. A heating coil may be installed in the unit to temper the incoming ventilating air during the winter months, if desirable.

If a large open area, similar to a general office, is to be conditioned by several self-contained units, it is not necessary to introduce ventilating air through all of the units. In these applications the required amount

of ventilating air can be supplied through a portion of the units.

Air Cleaning

The self-contained unit assures adequate air cleaning as the correct number, size and type of filter is an integral part of the unit design. These filters prevent dust, pollen, bacteria, soot, carbon particles and other foreign matter from entering the conditioned area. This serves as a protection for the occupants, the furnishings and the building interior. It also serves to lengthen the life of the air conditioning equipment and to provide constant performance at maximum efficiency.

Cooling Capacity

The most important function of any air conditioning installation for summer comfort cooling is to have sufficient cooling capacity to temper and to dehumidify the hot summer air. By using the self-contained unit, the rated cooling capacity for each unit is assured. Use of these units requires a minimum of engineering and detailed equipment selection for the average installation. The ratio of sensible heat to total capacity is designed to maintain inside conditions within the summer comfort zones even with peak design temperatures outside. If additional cooling capacity is required, it can be easily provided by placing additional self-contained units which in no way, will interfere with the operation of the system previously installed.

Utilities

The problem of utilities is less in the average multi-story building than in most other types of structure, as it has long been considered good design to provide utilities throughout the entire building. Quite often these are of sufficient size to supply a complete multiple unit air conditioning system. If new or additional utilities are required, they may be installed in a variety of locations, for example: Existing utility shafts, elevator shafts, stairwells and outside walls. Summer comfort cooling requires only three utilities —electricity, water and a drain. If year-around operation is desired it is only necessary to supply a source of heat.

Winter Operation

Quite often it is desirable to utilize the air conditioning system to supply warm air during the heating season. Multiple unit systems are very adaptable for this application. As previously stated, heating coils can be installed so as to temper the ventilating air entering an air shaft or installed in the individual units. If it is desirable to temper only the incoming ventilating air and an air shaft is not used, heating coils may be installed in the units which are selected to provide the ventilating air.

On the other hand, if it is desirable to heat the building in its entirety with the air conditioning system, it will be necessary to install heating coils in each of the individual units and control these as previously stated. This is seldom required in the conditioning of existing buildings, for in most cases a heating system is already installed and the air conditioning system is used only to temper the incoming ventilating air and to provide some additional heat to cold areas. Although the heating capacity is sufficient to heat the specified area, it is considered good practice to have a source of heat under each of the outside windows. This will alleviate a source of discomfort to persons working in these areas.

Self-contained units can be installed in multi-story buildings in several different ways:

(1) *As a complete system in each of several areas throughout the structure.* This type of installation was used in the majority of applications prior to the war and is still very popular. It is particularly applicable when part of the building is used for storage, warehousing, etc.

Many owners of multi-story buildings have discovered that areas formerly considered unsuitable for occupancy can be made to pay dividends merely by the installation of air conditioning.

Other multi-story building operators, although planning eventually to air condition a greater portion, or possibly the entire structure, start their installation by the application of self-contained units in certain areas, proceeding to other areas at a later date.

(2) *Complementary with an existing central system.* If a central system of air conditioning is installed, it is usually sized for the normal cooling load, with the additional provision of self-contained units in areas subject to high intermittent loadings, such as conference rooms, display rooms, etc.

A great variety of applications can be handled by the judicious installation of self-contained units in buildings which now have a central air conditioning

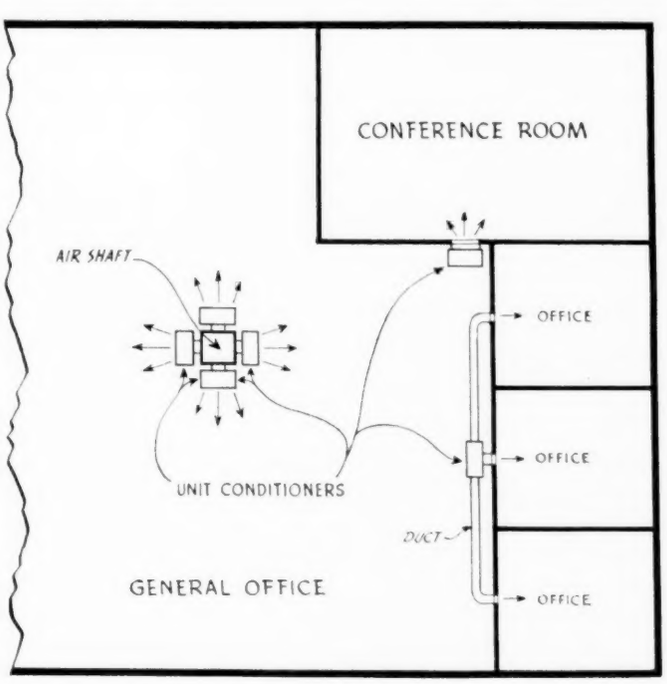


Fig. 3. An application of unit air conditioners. One unit is designed to condition a large conference room and another to condition three individual offices.

system. The present system in many multi-story buildings now provides air conditioning to only a portion of the structure and it has proven very practical to consider self-contained units whenever it is desirable to enlarge or increase the number of conditioned areas.

When self-contained units are installed complementary to an existing central system, no change is required in the present installation.

(3) *As a complete self-contained system for air conditioning an entire building.* This is certainly worthy of consideration, for all the features of self-contained units are emphasized in an installation of this type. Present-day planning of buildings to be air conditioned usually include the entire structure, with size of the building being no hindrance. This practice received particular impetus during the war by being widely publicized and its practicability proven.

An example of a typical application of the unit system to a multi-story building is shown in Fig. 2.

Ventilating air is supplied through an air shaft or by a short run of duct through the outside wall. Units are located adjacent to the ventilating shaft, which also serves as a distribution center for the various utilities.

In Fig. 3 showing the plan view of a typical floor, one unit is conditioning a large meeting or conference room and another unit is conditioning three individual offices. In each application, control is obtained by using the thermostat which comes as an integral part of each unit. Zoning is automatically obtained by having a separate unit for each exposure.

Summary of Advantages

In the following paragraphs we have listed some of the many advantages which are obtained by the building owners and occupants who have a self-contained air conditioning system.

A minimum of field engineering is required.

Provides a source of air circulation, ventilation, air cleaning, dehumidification, cooling and temperature control.

Each tenant or user has complete control of the equipment conditioning his space.

The ratio of sensible to total capacity is designed to maintain inside conditions within the summer comfort zones even with peak design temperatures outside.

Low noise level.

Operating cost is low. Units can be turned off when not in use.

Units can be moved or added to as required.

Individual units may be serviced without affecting other spaces.

Requires a minimum amount of cutting, patching and redecorating.

Minimum amount of duct work is required.

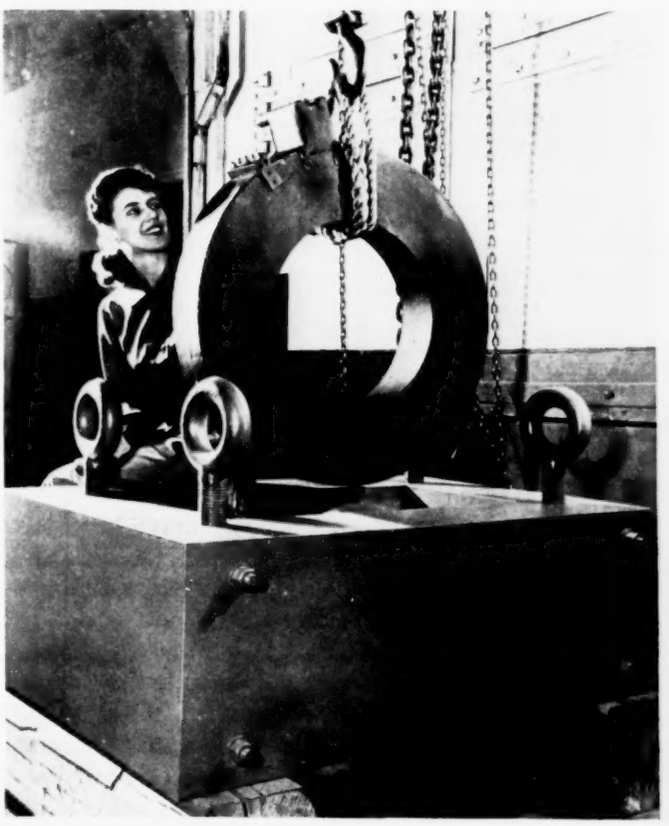
Six-Ton Electromagnet Extracts Heat

A 6-ton electromagnet, believed to be one of the largest and most powerful of its kind, is being built for Rutgers University by General Electric Engineering and Consulting Laboratory. It will be a part of the basic equipment of the new low-temperature laboratory at Rutgers and will be used in experiments requiring generation of exceptionally strong magnetic fields over large areas. Physicists hope to achieve absolute zero, (—460F.)

The new electromagnet provides a means for reaching ever lower temperatures, since the influence of a strong magnetic field on certain salts will remove additional amounts of heat from very cold materials. The instrument will also be used to study magnetic susceptibility at low temperatures and to investigate nuclear magnetic properties of various isotopes.

Engineers describe the device as 56 in. long, 39 in. wide and 20 in. high. The two coils are each 36 in. in diameter. The main body of the instrument, made of iron, weighs 10,000 lb and the coils, of copper wire, weigh 1,000 lb each.

It is as precision built as a watch. Pole faces of the magnet deviate from being perfectly parallel by only one-half a mil, or one-sixteenth of the thickness of an average sheet of paper. This precision is necessary to achieve a uniform magnetic field between the pole faces.



Methods of Joining Cast Iron Pipe

J. E. YORK

Building Service Engineer, Stone & Webster Engineering Corp.

This article, the third of three articles on joints for cast iron pipe, covers couplings, clamps and saddle joints for cast iron and steel pipe and flanged joints for cast iron pipe. The material is part of a group of articles on the general methods of joining pipe.

Couplings, Clamps and Saddle Joints

The joints previously described in this series of articles, including screwed, flanged, welded and poured joints, require a certain amount of skilled labor which is expensive, and in some cases expensive tools and equipment for their satisfactory installation.

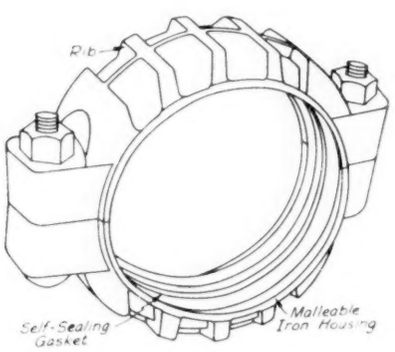


Fig. 1. Details of the Victaulic joint as assembled for service.

For water mains and gas mains which must at times be installed through rocky terrain, under water, in wet ditches, on bridges or in narrow trenches, joints which may be made up quickly and tightly by unskilled labor without expensive tools or equipment are very desirable.

In this article various types of couplings, clamps and saddle joints for use under such conditions with cast iron and steel pipe will be described.

Victaulic Pipe Couplings

The Victaulic type of joint originated during World War I, at which time it was known as the Victory Joint, and because it immediately found application in hydraulics it became known as the Victaulic Joint.

It is a very versatile type of joint and is widely used in the oil, mining, shipbuilding, municipal, and other industrial fields not only in the United States but also in many foreign countries.

As shown in Fig. 1, it consists of a single gasket, two half housings and two bolts, which can be assembled and made tight with only one tool—a socket wrench, on either cast iron or steel pipe provided with turned grooves near the ends to receive the key sections of the housing.

The particular advantages claimed for it by the manufacturers are:

(1) Speed and ease of assembly or salvage. Centering of the Victaulic coupling on the pipe is automatic requiring no guess work, marking of pipe, special skill or training to make tight joints.

(2) Flexibility as an inherent feature of the joint because the key section of the housing floats in the pipe-end groove with definite but liberal key and groove clearances.

(3) Provision for expansion and contraction because the width of the grooves on the pipe exceeds the width of face of the key section on the housing, thus allowing movement of the pipe with changes in temperature.

(4) The joint is locked and is slip-proof as shown in Fig. 2. It cannot pull out or blow-off under pressure, vibration or sag. The couplings are designed to grip pipe ends all around and will develop the full pressure rating of the pipe. Excessive bolt tension is unnecessary. This feature eliminates guess work and danger of joints whose tightness depends on bolt tension.

(5) Joints are leak-tight under pressure or vacuum. Either pressure or vacuum tends to make a tighter seal between the gasket and the pipe as shown in Fig. 3.

(6) By dismantling two joints anywhere in the line, any individual length of pipe or valve or fitting requiring maintenance or repair can be quickly removed or replaced without disturbing adjoining sections of pipe.

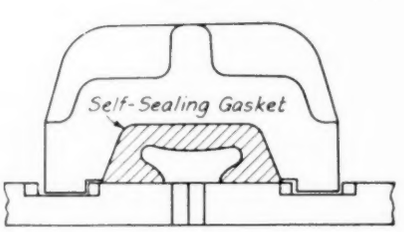


Fig. 2. Victaulic joint with gasket locked in place.

Gaskets for this type of joint are one piece annular moulded rings commonly furnished in two compounds:

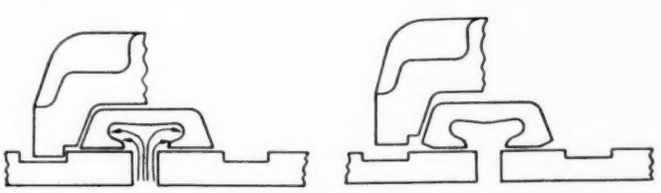


Fig. 3, left. As pressure is applied, gasket seal is strengthened. Fig. 4, right. Stretching the gasket over the pipe ends places the angular lips in sealing tension.

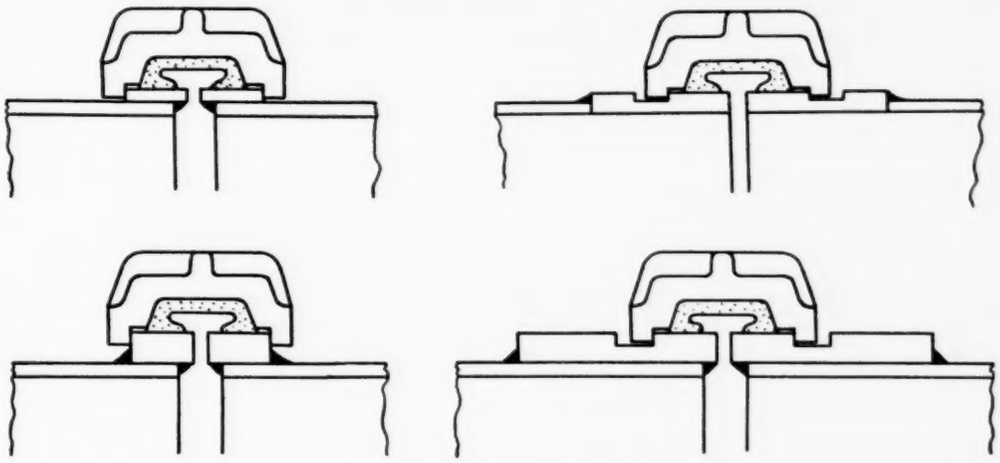


Fig. 6, upper left. Adaptation of Victaulic type joint for use with light wall pipe which does not lend itself to grooving. Fig. 7, upper right, Alternate method for use with spiral pipe. Fig. 8, lower left, Method used with larger diameter pipe at high pressures. Fig. 9, lower right. Application where increased rigidity of pipe ends is desirable for large pipe diameters.

Victaulite, a synthetic base compound, which is recommended for oil, gasoline and other petroleum products.

A high quality, carefully vulcanized rubber-base compound which is recommended for air, water, most dilute acid and general service.

These standard gasket compounds are recommended for temperatures up to 180F. Gaskets are so moulded as to provide an inclined lip angle which insures immediate and automatic sealing tension when the gasket is stretched over the pipe as shown in Fig. 4. When installing gaskets on pipe sizes 10 in. and larger, it is convenient to turn the gasket inside out on one pipe end and then roll or flip it over into the spanning position.

The two halves of the coupling are provided with circumferential reinforcing web members to offset circumferential stresses and axial reinforcing rib members to resist axial stresses.

Table 1 shows the saving in weight which is possible by use of this type of joint as compared with series 15 steel flanged joints.

In Fig. 5 a comparison of the amount of metal to be removed from a piece of pipe for a threaded joint and for a Victaulic joint is shown.

A simple adaptation of this type of joint, Fig. 6, is shown for use with light wall steel tubing or other light pipe which does not lend itself to grooving.

In Fig. 7 an alternate method for use with spiral pipe is presented and in Fig. 8 is shown the method used with larger diameter pipe at relatively high pressures.

The adaptation shown in Fig. 9 is generally used on pipe 30 in. diam and larger where increased rigidity of pipe ends is desirable.

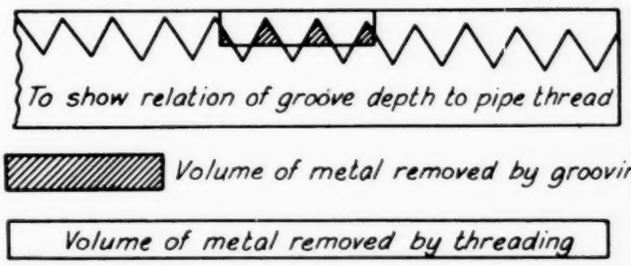

To show relation of groove depth to pipe thread
Volume of metal removed by grooving
Volume of metal removed by threading

Fig. 5. Comparison of the metal to be removed from pipe for a threaded joint as compared with metal removed for grooving.

Table 1 — Savings through Use of Victaulic Coupling Compared with Series 15 Steel Flanged Joints

	2 in.	4 in.	6 in.	12 in.	20 in.
Bolts—Number					
Series 15 steel	4	8	8	12	20
Victaulic	2	2	2	2	2
Savings	2	6	6	10	18
Outside dia.—in.					
Series 15 steel	6	9	11	19	27½
Victaulic	3⅝	6⅜	8⅞	15½	23½
Savings	2⅜	2⅝	2⅛	3½	4
Weight—lb.					
Series 15 steel	12	28	42.5	133	357
Victaulic	2.7	7	13.5	40	75
Savings	9.3	21	29	93	282

Fig. 10, left. Shoulder or raised ends. Fig. 11, right. Grooved ends. Both types are furnished for cast iron pipes.

Figures 10 and 11 illustrate shoulder or raised ends and grooved ends respectively as commonly furnished by foundries for cast iron pipe.

Dresser Couplings

The use of these couplings provides the following basic advantages for pipe joints:

(1) Simplicity—few ready-made parts which are easily assembled.

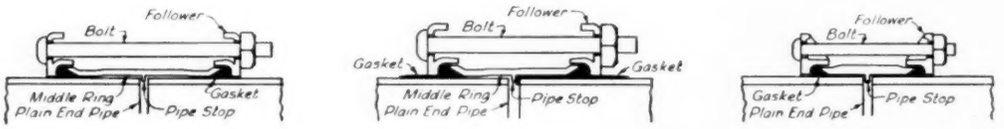
(2) Speed—after simple instructions, inexperienced workmen can rapidly make flexible, leak-proof joints.

(3) Flexibility—standard couplings will absorb expansion or contraction up to ⅜ in. and deflection of 4° or more depending on size.

(4) Tightness—joints will remain tight under all pressures (internal or external) for which they are designed.

(5) Permanence—the first joint which was installed in Malta, Ohio, in 1891, has required no major repairs and is still satisfactory.

(6) Salvage—couplings can be disconnected readily and reused, if desired.



Left to right, forms of Dresser couplings. Fig. 12, steel coupling. Fig. 13. Coupling with special insulating aprons. Fig. 14. Cast couplings for cast iron pipes.

All couplings are factory built with interchangeable parts. The only tool required for assembly is a wrench. Lines can be joined day or night in any weather or, if necessary, in a wet ditch.

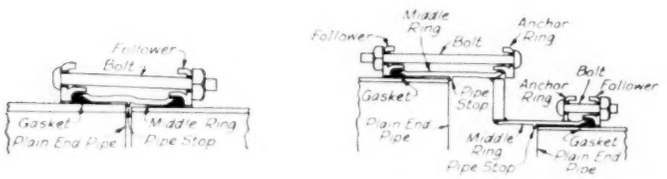


Fig. 15, left. Reducing coupling where the difference in pipe diameters is small. Fig. 16, right. Reducing coupling for larger pipe diameter difference.

Pipe lines may be assembled above ditch as the flexible joints will absorb lowering stresses. After assembly above ditch, the line can be immediately lowered and the trench back-filled. Only limited working space is necessary and the operation of installation is performed without noise, or fire hazard. Pipe ends are plain without threads or grooves, and, even if too thin to groove or thread, the pipe may be used. Pipe already threaded or grooved can also be used.

Exact alignment of pipe ends is unnecessary which facilitates making connections to heavy machinery or equipment. Curves may be made with straight lengths of pipe and the flexibility of couplings assures satisfactory performance in swampy or uneven terrain, or where vibration may be encountered. Vibration noises are not transmitted along the pipe and where lines go through walls or bulk heads, both pipe and structure are protected from damage that might occur if connections were rigid.

Some of the various forms of this type of joint that are available, are illustrated and described.

The steel coupling which is shown in Fig. 12 consists of one cylindrical steel middle ring, two steel follower rings, two resilient gaskets of a special compound, and a set of high strength track-head bolts.

The middle ring has a conical flare at each end to receive the wedge portion of the gaskets. The follower rings confine the outer ends of the gaskets. Tightening the bolts draws the follower rings toward each other, compressing the gaskets and making a flexible leak-proof seal.

This style of joint is widely used for steel pipe and plain end cast iron pipe.

The insulating couplings, Fig. 13, have special insulating aprons which extend from the gasket heel to several inches beyond the follower rings. The No. 2 gasket also extends from the gasket toe to completely cover one pipe end. As a result, metal to metal contact is broken at the joint. Each pipe section becomes an insulated unit and current cannot pass along the line.

This type of joint is used where it is necessary to provide protection against electrical current flow along pipe lines. Special insulating couplings for use on lines carrying oil, gasoline and many other solvents are available.

Cast couplings for use with cast iron pipe are shown in Fig. 14. The middle rings are of cast iron and followers are made from high grade malleable iron. These couplings are recommended for all working pressures up to the value for which regular cast iron pipe of the size specified is suitable.

For temperatures in excess of 215° asbestos gaskets are available and should be used.

Two types of reducing couplings—one for use where the difference in pipe diameters is small is shown in Fig. 15 and the other for joints where the differences in pipe diameter are larger is shown in Fig. 16.

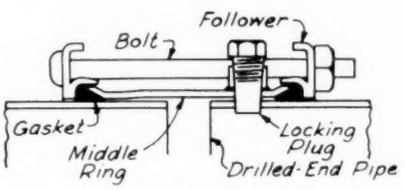


Fig. 17. Lock coupling.

Lock couplings shown in Fig. 17, lock the pipe and coupling together and provide flexibility to protect the line from break due to unusual movement. They are necessary only under exceptional conditions as on sprinkler systems and tank risers in earthquake areas or on unanchored high pressure surface lines where added holding strength is required.

Joint locking devices are furnished in two types as shown in Fig. 18. In Fig. 18 (left), four steel tie bolts extend from cast steel lugs welded on the pipe to lugs welded on the middle ring of a standard style coupling. Two of these tie bolts, diametrically oppo-

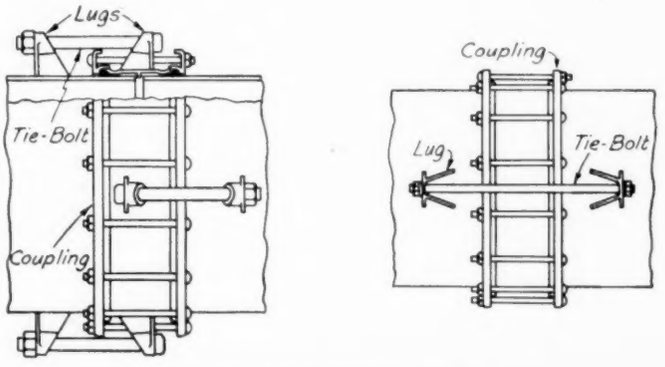


Fig. 18. Joint locking devices.

site each other, connect with one pipe section, while the other two tie bolts, also diametrically opposed but at a 90° angle to the first pair, reach to the other pipe section. This arrangement permits a universal joint action of the pipe, yet maintains a positive lock against extreme thrust at all times. This type of coupling is used for intake lines and similar installations.

The second of these devices has steel tie bolts, diametrically opposite, which extend across the joint from "crow foot" cast steel lugs welded on to the pipe at either side of the joint. This type of joint is very effective on unanchored bends subject to pulsating pressures of sharp intensity.

For use on small piping to pumps, compressors, engines and other equipment and on small pipe lines in industrial plants, buildings, homes, mines and railroads the no-thread fitting shown in Fig. 19 is used. This type fitting will absorb expansion and contraction without leakage; the resilient seal will safeguard piping against vibration and will dampen vibration noises.

Deflections as great as 6° are possible with this type of joint.

The fittings shown in Fig. 20 were developed for use on underground lines and wherever conditions of service require extra strength, flexibility and resistance to corrosion. Plain and armored gaskets are regularly furnished. Asbestos gaskets can be furnished for temperatures over 210F. Insulating gaskets similar to those shown in Fig. 13 for couplings and insulating adaptor gaskets can be furnished, if required.

These fittings consist of a steel or malleable iron body, steel-end nuts and resilient wedge-shaped gaskets, which are protected from thread damage by steel gasket retainer cups. The threaded-end nuts when screwed on the threaded body compress the gaskets to make the seal.

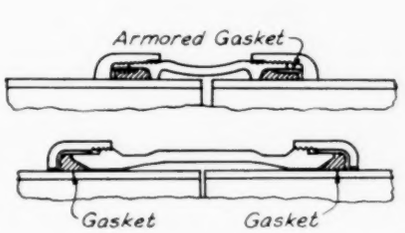


Fig. 19, upper. Fitting to absorb expansion and contraction without leakage. Fig. 20, lower. Coupling for underground lines.

The body has machined wedge shaped ends to provide a gasket seat with uniform pack at all points. The bellied out design permits pipe deflection. The gaskets are of wedge shaped section of special compound to give long life. A cup-shaped gasket retainer automatically centers itself in correct position on the gasket and keeps the gasket from slipping out of position.

It also prevents friction between the gasket and the end nut; prevents the gasket catching in the threads of the end nut; and closely confines the gasket, thus permitting more clearance between the end nut and the pipe, and greater pipe deflection. The end nuts are of hot forged steel with long threading to provide reserve take-up, coarse threads for easy starting, and overlap to protect threads from corrosion.

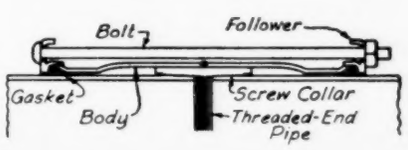


Fig. 21. Sleeve for steel pipe line under water.

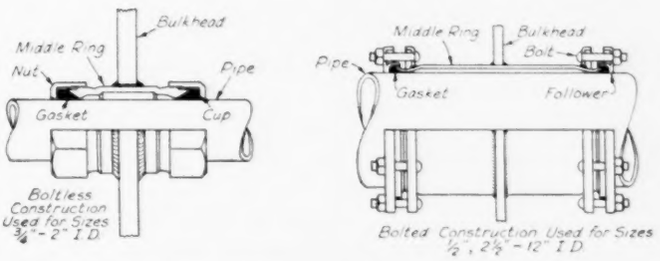


Fig. 22. Two types of bulkhead seals for pipe that passes through bulkheads or walls.

The sleeves as shown in Fig. 21 are for use on steel pipe lines laid under water where a dual joint is desired for extra protection. Each sleeve consists of a screw collar (threaded coupling) welded inside the body of a long sleeve. The screw connection holds the pipe together and provides rigidity. The body acts as a strong pressure tight housing and in combination with the gasketed ends provides a safeguard against failure of the screw connection.

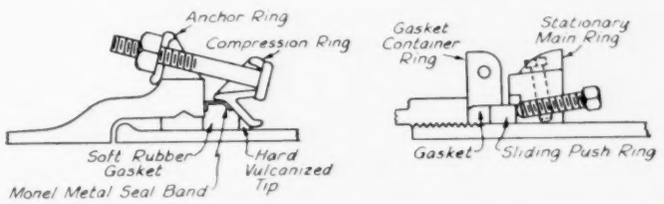


Fig. 23, left. Bell joint clamp. Fig. 24, right. Clamp for sealing leaky threaded joints.

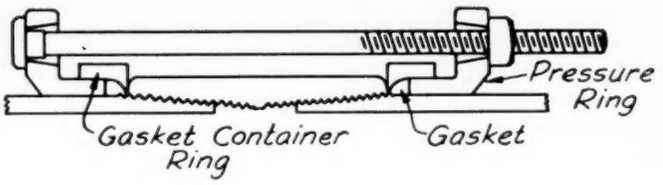
Two types of bulk head seals for tight joints through steel bulk heads or walls are shown in Fig. 22.

Clamps

It is sometimes necessary to stop a leak in a bell and spigot type joint in a water line where it is not practical to shut down the system and drain the line and where calking fails to make the joint tight.

A Skinner Bell Joint Clamp as shown in Fig. 23 may be used for this purpose. This joint clamp consists of an anchor ring and a compression ring each consisting of two sections which are bolted together after assembling on the pipe, and a soft rubber gasket with a Monel metal seal band which is soft enough to conform to irregularities in the face of the bell and a hard vulcanized tip which acts as a plug to prevent the gasket being squeezed out between the compression ring and the spigot piece.

The gasket is of soft rubber and under pressure becomes a "solid" fluid which flows at equalized pressure into every crevice in the joint thus sealing the leak at its source.



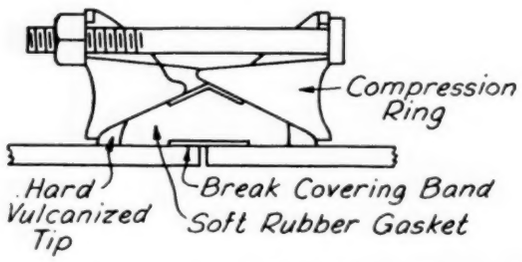


Fig. 25, upper. Clamp for sealing leaks at threaded couplings.

Fig. 26, lower. Clamp for repairing broken cast-iron pipe.

A similar type of joint is furnished by the Dresser Manufacturing Division of the Dresser Co.

For sealing leaky threaded joints, the clamp shown in Fig. 24 is used on oil, gasoline, steam, gas, water, ammonia and brine lines.

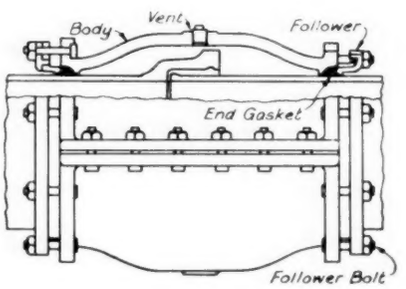


Fig. 27. Clamp to repair split in pipe close to a bell.

It has been particularly effective on lines in oil refineries for pressures up to 2,000 lb per square inch, and on boiler headers and other high pressure or high temperature joints.

This joint consists of a gasket container ring, gasket, stationary main ring and a sliding push ring.

The rings are made of malleable iron and rings and gasket are split for assembly on the pipe and the halves are bolted together.

The gasket is confined by the container ring as it is compressed by the sliding push ring which is forced forward by tightening the thrust screws. The stationary main ring is held in place by tightening set screws against the pipe.

For sealing leaks at threaded couplings, there are several type joints. One is shown in Fig. 25.

For repairing broken cast iron pipe mains, the joint shown in Fig. 26 is used. A joint for sealing a leaky welded joint is somewhat similar to this.

A special joint is used for repairing pit holes, splits and corrosion leaks in both steel and cast iron pipe lines. Occasionally, it may be necessary to repair a split bell or breaks in the pipe close to a bell and for this purpose the joints shown in Fig. 27 is used.

This type of repair joint completely encloses and permanently seals a split bell and eliminates the necessity for shutdown while the damaged piece is removed and replaced. A vent opening tapped for a standard pipe plug is provided to facilitate installation under pressure.

Service Connections

For making service connections on existing gas, oil and water mains without the necessity of cutting in fittings, a Service Saddle as shown in Fig. 28 is sometimes used. After the saddle is installed and the bolts tightened a street tee or fitting is screwed in place, and then a street ell is screwed into the branch outlet and the service pipe is connected.

A drilling device is then used to cut the proper size opening in the main and after the drilling device has been removed the outlet on the run of the street tee is plugged completing the joint.

Where it is desirable to make a service connection that cannot shift a "nonshift" service saddle may be used. This is provided with a tapered bushing that fits the hole in the pipe and prevents shifting.

Flanged Joints

Cast iron lines for use where exposed, are commonly furnished with flanges cast integrally with the pipe. These are faced and drilled as described under an earlier article on flanged joints, and have plain face for 125 lb pressure, and 1/16 in. raised face for 250 lb pressure.

The use of cast iron flanged pipe underground is not generally desirable because of the corrosion of the bolts and because settlement or other causes may result in excessive strains on the flanges with resultant breaking, or cracking of the pipe immediately back of the flanges.

Where because of settlement or other reasons the faces of flanges on adjacent sections of cast iron pipe

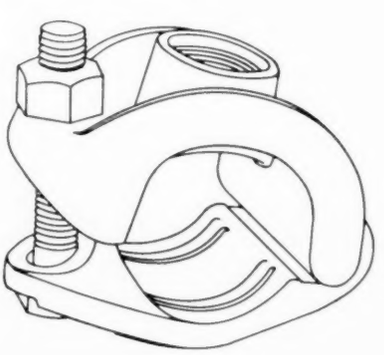


Fig. 28. Service saddle for making service connections to lines in service.

are not parallel, a tight joint may be made without excessive stress on the flanges by use of a dutchman and two gaskets between the flanges as shown in Fig. 29.

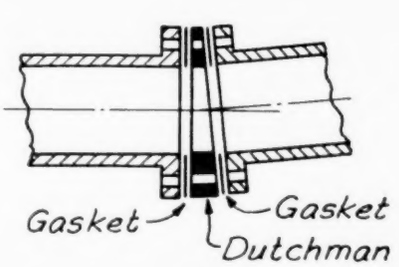


Fig. 29. Method for joining flanged pipe.

Ventilation for Control of Dust from Bagging Operations

GEORGE M. HAMA

Ventilation Engineer, Bureau of Industrial Hygiene,
Detroit Department of Health

THE bagging of powdered materials such as cement, flour, parting compounds, carburizing compounds, and other finely divided substances is generally accompanied by high concentrations of airborne dusts. Standard impinger dust determinations counted by the lightfield technique indicate that bagging machine workers at uncontrolled operations are exposed to concentrations of dust in the magnitude of 100 million to 1000 million particles of dust per cubic foot of air. Airborne dust is disseminated by displaced air from the bag, spillage in filling the bag, and motions of the worker and the moving parts of the bagging machine.

It is desirable to ventilate dusty bagging operations, not only because of the health hazard of certain dusts to the worker, but also from the standpoint of good housekeeping, nuisance control, and the protection of moving parts of machinery. From the health standpoint, certain toxic and pneumoconiosis-producing dusts, such as parting compounds containing a high concentration of free silica, and carburizing compounds containing cyanides and barium, must be controlled to a very low concentration.

Local exhaust hoods of the double-canopy type where the air is exhausted in the concentric space between the hood and the bag-filling tube of the bagging machine do not completely control the dust, inasmuch as dust spillage and dust stirred up by the machine and bag motions get beyond the control of the exhaust ventilation. Side draft hoods and slots likewise do not give complete control to the dust dissemination. From a number of dust counts taken on various types of local exhaust hoods, it has been found that the best type of control is accomplished by the simple three-sided booth enclosure hood.

The accompanying photographs illustrate this type of hood. The weighing scale, electric light and all machinery is enclosed within the hood. The quantity of air exhausted can be kept at a minimum by reducing the open area of the hood by a plexiglas window which allows operating vision for the workers. The floor of the booth enclosure is equipped with a hinged plate edging which confines the dust spillage within the hood and prevents dust from piling up in the operator's standing area. A worker walking in such dust can disseminate high concentrations of airborne dust. The dust can be shoveled out of the booth enclosure at the end of the day's shift.

Air velocities required across the face opening of this booth enclosure range from 200 to 250 linear feet per minute for bagging machines located on loading docks, large workroom areas and locations where high velocity cross drafts are present. In small workroom areas where cross drafts are of a low velocity, air velocities as low as 150 to 200 linear feet per minute will adequately control the dust. It is advisable to connect the branch exhaust duct to the top or upper portions of the hood so that a higher velocity is attained at the upper section of the booth where the greatest dust dissemination is present. The branch pipe in the booth enclosure illustrated takes off the top of the hood with the resultant distribution of airflow: top third of face, 250 linear feet per minute, center of face opening, 200 linear feet per minute, bottom third of face opening, 150 linear feet per minute. On the bagging operation illustrated, dust counts made before the ventilation was installed ranged from 173 to 182 million particles per cubic foot of air. With the ventilation installed, the average dust concentration in the worker's breathing zone was found to be of the order of 3.5 million particles per cubic foot of air.

Photos through courtesy of Gibraltar Floors, Inc.

(Left) General arrangement, (center) close-up of bagging operation and (right) close-up of exhaust duct from the hood.

THE SALES ENGINEER

Mapping Out Potential Business

BERNARD LESTER
Sales Engineering Consultant

HAVE you watched a good engineer design a machine or lay out an installation? The finished design is based on facts and a plan. Cut and try, to be sure, but also fact and logic. Mistakes are costly.

But too many Sales Engineers proceed neither with adequate facts nor a logical plan. To them, mistakes —waste time and effort—are also extremely costly.

The objective of every Sales Engineer should be to sell the largest volume of substantial and creative business in the shortest time and with the least effort. This never can be accomplished by "hunch." Simple, reliable and usable facts are required upon the market.

Some Sales Engineers selling heating, ventilating, and air treating equipment have their work laid out for them. A market survey might be prepared by the home office and furnished them. Not often, unfortunately, is this the case. Most Sales Engineers are given a territory, furnished sales tools good or indifferent, and perhaps a hearty "good luck" from the boss. What should he do to direct his sales effort?

In attempting to uncover an answer, let us choose the Sales Engineer who has just been assigned a new territory to handle, which is composed of a conglomerate mass of past purchasers and possible future buyers. The time and expense of an immediate detailed market survey are out of the question.

Two lines of procedure appear desirable:

First, start with existing purchasers,—apparatus already sold and installed. This gives an immediate customer list to work upon.

Second, establish a system for building up simple records on customers, prospects, and markets. The data can be consistently accumulated, in parallel with daily selling effort.

For past purchasers the Sales Engineer should establish:

(a) Who bought the apparatus? Where is he located? What individuals have the say?

(b) In what industry classification does the purchaser belong (textile mill, laundry, office building, wood working plant, theater, contractor, etc.)?

(c) The class and approximate volume of apparatus bought. Were repeat purchases made? Was the purchase evidently satisfactory or troublesome?

With such a quick survey the Sales Engineer gets a grasp of existing buyers, a rough picture of customer location to efficiently map out sales calls, and a feel of the character of this territory's industrial activity.

Obviously, the first duty of this Sales Engineer is to reach and serve existing customers, for their satisfaction is his stock in trade.

Thus started, he cannot only sell, but add to his opportunity by constantly gathering additional data on his territorial possibilities.

He learns to use directories issued by states and counties, classified telephone directories, trade magazines of interest to customer groups, press notices and news items. He watches competitors. Sees where they are weak, and grasps the opportunity. He avoids cheap markets, and goes where he can sell engineering skill. He establishes a chain of friends, and is constantly asking questions.

As the Sales Engineer proceeds he can thus in time develop a complete picture of his market area. He should keep a map of his territory before him. I doubt the value of the "thumb tack" idea for marking each customer on this map. One easily forgets to keep it up to date, and in highly congested areas there is not room on the average map for the many tacks. Better employ a listing of each customer arranged according to counties, cities and towns.

With such an approach to his market analysis, and such pertinent information, this Sales Engineer can greatly increase his efficiency. From it, planned action might come along such lines as these:—

Establishing a valuable mailing list for sales promotional material.

Setting up a plan of maintenance service to help keep customers satisfied and make a profit.

Getting the home office to shape its advertising to develop his position with predominant industries in his territory.

Selecting certain propitious applications, and becoming an expert and an authority on them to the extent his skill is sought after.

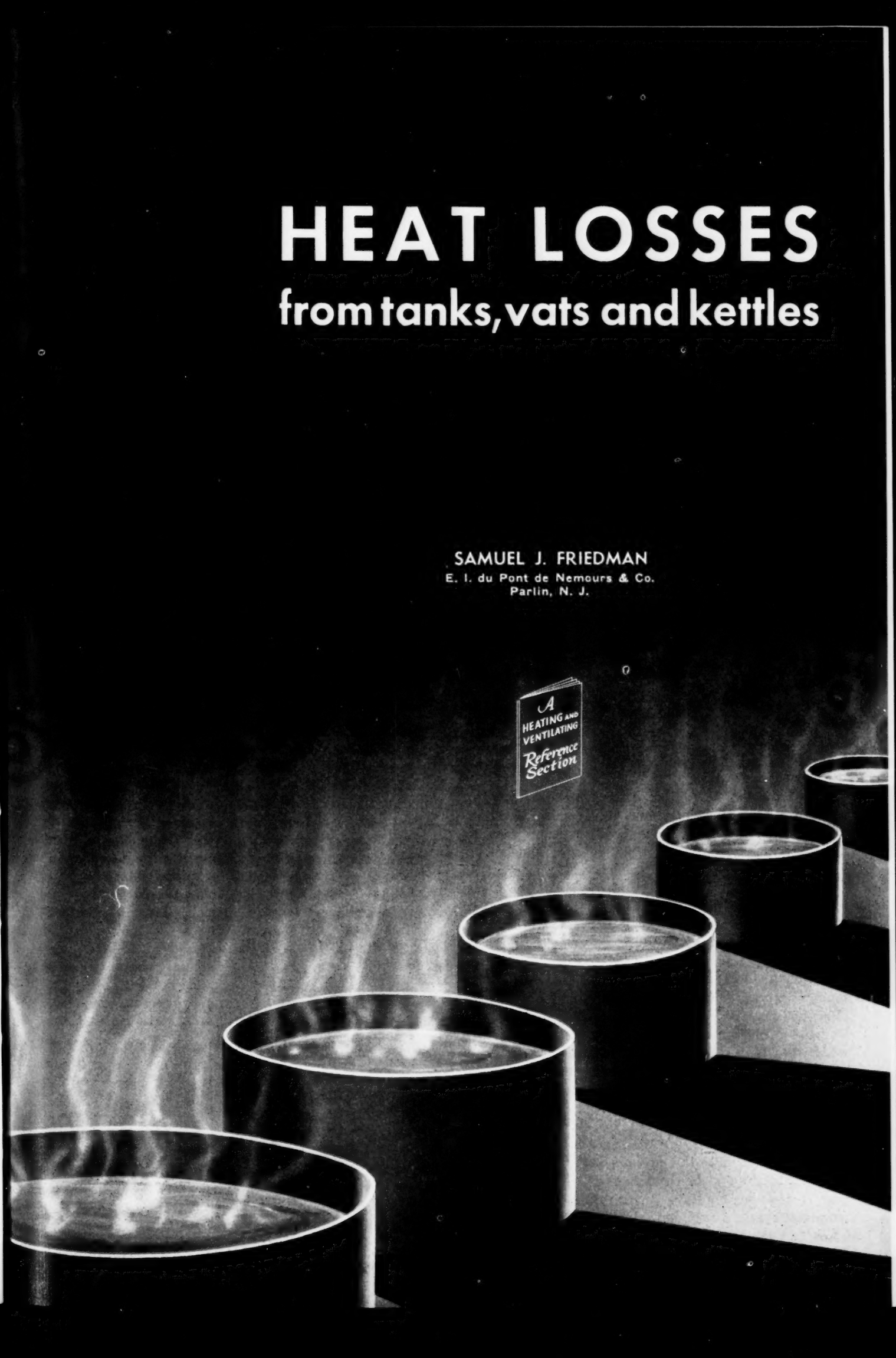
Develop his ability to speak before technical or trade groups on subjects relating to his business and vital to the industrial community.

Enhance his value to the home office, and himself, by suggesting new designs and apparatus improvements.

Resourcefulness on the part of the Sales Engineer in continually developing, recording and using data upon his market yields him big dividends.

HEAT LOSSES
from tanks, vats and kettles

SAMUEL J. FRIEDMAN
E. I. du Pont de Nemours & Co.
Parlin, N. J.



Heat Losses from Tanks, Vats and Kettles

SAMUEL J. FRIEDMAN
E. I. du Pont de Nemours & Co., Parlin, N. J.

In many of the process and manufacturing industries it is necessary to maintain tanks either below or above the temperature of their surroundings by means of a heating or cooling medium. Reaction kettles, process storage tanks, accumulators, and similar vessels which are used are usually open to the atmosphere. To maintain these units at the proper temperature levels, it is necessary to supply or remove the amount of heat involved in the process plus the amount of heat lost to or gained from the surroundings. Since this latter heat quantity may often be much greater than the heat required in the actual processing (such as the quantity required to heat cold articles immersed in a warm bath) it is desirable to be able to estimate the heat losses or gains accurately so that the proper amount of heat transfer surface can be installed in the tank. This article demonstrates the method of estimating these heat losses or gains from information and relationships which are available in current literature.

IN general, there are two distinctly different cases of heat loss from tanks; (1) heat loss from surfaces where no mass transfer (evaporation or condensation) occurs, and (2) heat loss from surfaces at which mass transfer is also occurring. These two cases are illustrated in *A* and *B*, Fig. 1.

Fig. 1*A* shows a reaction kettle which is heated or cooled by coils and the temperature maintained uniform within the kettle by vigorous stirring with an agitator. Consider the case where the fluid in the kettle is maintained at a temperature higher than its surroundings. Heat is lost to the walls of the vessel by conduction through a thin film of the liquid which remains stagnant on the inside surface of the tank. The thickness of this layer depends upon the physical properties of the fluid and the vigorousness of the agitation inside the tank. The heat thus lost to the tank walls passes through the walls and any insulation that may be applied to the outside of the tank. Under equilibrium conditions (when the temperature within the tank, the tank walls and the insulation is not changing), the amount of heat passing through the tank wall and the insulation will be equal to that passing through the stagnant layer of the liquid within the tank.

However, upon reaching the surface of the tank or insulation exposed to the surroundings, this heat flow is dissipated by two or three methods. (1) It radiates heat to the surroundings (which will be at a lower temperature) at a rate dependent upon the characteristics and temperature of the surface. (2) It loses heat by convection to the surrounding air at a rate dependent primarily upon the velocity of the air past the surface and the temperature difference between the air and the surface. (3) Heat is lost by conduction from the surface through the supports of the tank. This quantity will depend upon the cross-section of the supports and their material of construction. The sum of the heat lost by these three methods will always be equal to the amount of heat conducted to the surface through the tank wall and the insulation.

For the case when the contents of the kettle are at a temperature lower than the surroundings, the reverse phenomena happen; namely, heat is gained by the outside surface by radiation from the surroundings, by convection from the air immediately surrounding it, and by conduction from the supports. It is transmitted by conduction through the tank wall and insulation to the fluid in the tank. Upon rare occasions, when the kettle is maintained at very low temperatures, some heat is gained by condensation of moisture from the surrounding air upon the surface or in the interstices of the insulation. Since this condition should be avoided (by placing sufficiently thick and impermeable insulation around the tank), it will be considered beyond the scope of this article.

Fig. 1*B* represents the general case that will be encountered if the fluid being heated or cooled is exposed to the atmosphere. The tank can be heated by coils, as is shown in the drawing, or by other means such as a jacket, electrical strip heaters, or by injecting live steam into the bath. Agitation can be accomplished by a conventional mixer or agitator, by the action of live steam jets, by bubbling of compressed air through the tank, or by movement through the tank of the material being processed.

Again consider the case where the contents of the tank are at a temperature above that of the surround-

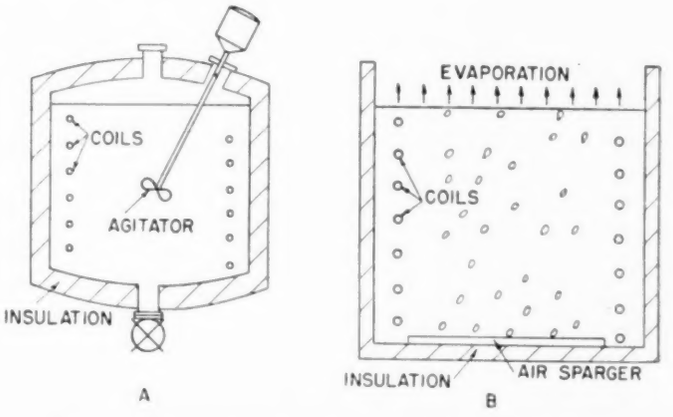


Fig. 1. Schematic diagram of two general cases of heat losses from tanks.

Table 1 — Thermal Conductivity of Some Insulations

Insulation Type	Thermal Conductivity, Btu per (hr) (sq ft) (F per in.)		
	50F	100F	150F
Asbestos sponge	0.37	0.40	0.42
Cellular glass	0.40	0.43	0.46
Cork	0.25	0.27	0.29
85% magnesia	0.41	0.42	0.44
Mineral wool blanket.....	0.36	0.39	0.42
Molded asbestos	0.30	0.32	0.35
Molded diatomaceous earth	0.48	0.50	0.52
Wood	...	2.2	...

Figures are from manufacturers' data.

ings. Heat losses through the sides and bottom of the tank will occur in the same manner as was outlined for the closed tank.

Loss Through Evaporation

At the exposed surface, however, heat is lost or gained in a slightly different manner. As in the case of the exposed insulation surface, heat is lost by convection and radiation to the surroundings. Simultaneous with these processes, however, additional heat is also lost by liquid evaporating from the exposed surface. The amount of heat lost is approximately equal to that required to vaporize the fluid evaporated. The amount of evaporation occurring depends upon the vapor pressure of the evaporating fluid under the conditions prevailing in the tank and upon the velocity and humidity of the surrounding air.

Although the evaporation of the liquid at the surface will usually occur, there are certain conditions under which this phenomenon may be complicated by a combination of happenings. If a completely dry atmosphere is maintained above the tank (relative humidity approximately zero), evaporation into the atmosphere will always occur with an attendant loss in heat. Thus, a tank may be maintained below ambient temperature (say 50F with a surrounding temperature of 70F) and lose heat from this surface by evaporation and gain it through the same surface by radiation and conduction from its surroundings with a net heat loss or gain of zero.

If, however, the surrounding air contains moisture to an extent that the vapor pressure of water in this air exceeds that of the water in the solution, condensation will occur at the surface. Thus, in the preceding example the heat gain by convection and radiation would be augmented by the heat of condensation of moisture from the air. Likewise, if the solution exposed to the atmosphere is very concentrated so that the vapor pressure of water in the solution is severely depressed (concentrated sulfuric acid solutions, calcium chloride brine solutions) it is entirely possible that in humid atmospheres, heat will be gained by condensation of water in the solution despite the fact that the solution may be above ambient temperature and losing heat from the free surface by radiation and convection. Under these conditions, the concentration of the solutions would be continually decreasing.

The most complex case to be encountered at this interface will be when pure, non-aqueous, water-miscible liquids are exposed to humid atmospheres. Under all temperature conditions, the liquid will evaporate into the atmosphere causing a heat loss and moisture will always condense into the liquid causing a heat gain, independent of whether heat is being lost or gained at the surface by radiation and convection. The condensation of water into the non-aqueous liquid (such as methanol, ethylene glycol, or glycerol) will continue until the concentration of water in the liquid is such that its vapor pressure in the solution equals its vapor pressure in the air.

For water-immiscible liquids, evaporation of the liquid will always occur at the surface, but condensation of water will occur only when the temperature of the liquid surface is below the dew-point temperature of the surrounding air.

In the special case where compressed air is used for agitation of the tank, an additional heat loss or gain is incurred. When the temperature of the tank contents is above that of the air, heat is lost to the agitating air by convection heating of the air and evaporation of the liquid into the air. When the contents are cooler than the air, heat is gained by convection from

Table 2 — Emissivity of Various Surfaces

Surface	Fraction of Black Body Radiation		
	50-100F	1000F	Solar Radiation
1. Black non-metallic surfaces such as asphalt, carbon, slate, paint, paper.....	0.90-0.98	0.90-0.98	0.85-0.98
2. Red brick and tile, concrete and stone, rusty steel and iron, dark paints (red, brown, green, etc.).....	0.85-0.95	0.75-0.90	0.65-0.80
3. Yellow and buff brick and stone, firebrick, fire clay.....	0.85-0.95	0.70-0.85	0.50-0.70
4. White or light cream brick; tile, paint or paper, plaster, white wash.....	0.85-0.95	0.60-0.75	0.3-0.5
5. Bright aluminum paint, gilt or bronze paint	0.4-0.6	....	0.3-0.5
6. Dull brass, copper, or aluminum; galvanized steel, polished iron.....	0.2-0.3	....	0.3-0.5
7. Polished brass, copper, monel metal....	0.02-0.05	0.05-0.15	0.3-0.5
8. Highly polished aluminum, tin plate, nickel, chromium	0.02-0.21	0.05-0.10	0.10-0.40

Data from table in Amer. Soc. of Heating and Ventilating Eng. "Heating, Ventilating Air Conditioning Guide—1947".

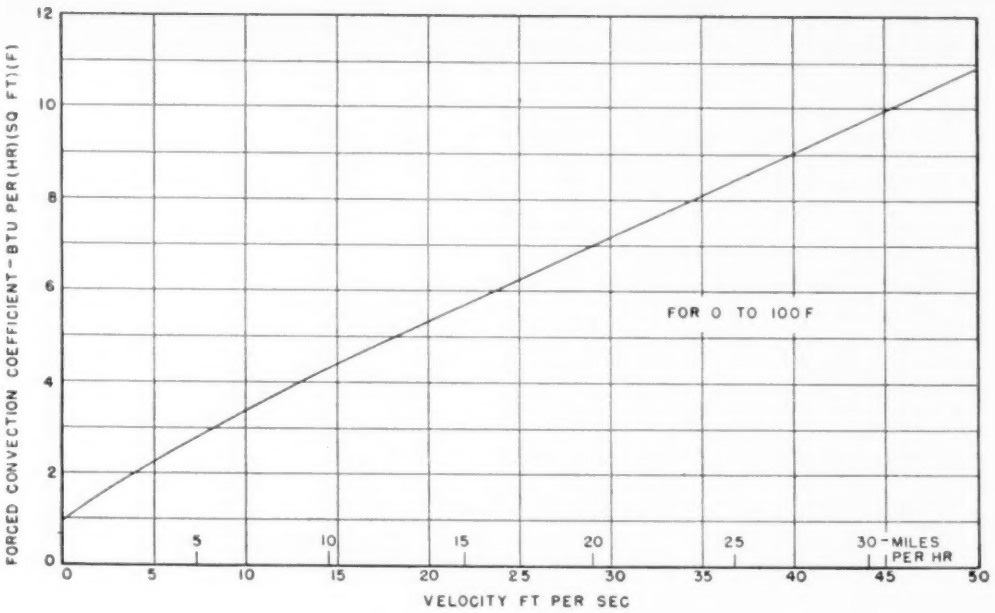


Fig. 2. Forced convection coefficient from flat surfaces to air.

the air and may be gained by condensation of moisture from the air, or may be lost by evaporation into the air.

Losses from Unexposed Liquid Surfaces

Losses from unexposed surfaces can be estimated by methods outlined in several standard reference texts (14, 17, 19). The rate of heat loss can be expressed by:

$$q = UA \triangle t \qquad (1)$$

where q = heat loss, Btu per hr; U = overall heat-transfer coefficient from the contents of the tank to the surroundings, Btu per (hr) (sq ft) (F); A = area exposed to the surroundings, sq ft; $\triangle t$ = the difference in temperature between the tank contents and the surroundings, F. Since the temperature difference and the area are known, it is necessary only to evaluate U, the overall heat-transfer coefficient. This U equals

$$\frac{1}{\frac{1}{h_i}\left(\frac{A_w}{A}\right) + \frac{L_w}{k_w}\left(\frac{A_w}{A}\right) + \frac{L_1}{k_1}\left(\frac{A_1}{A}\right) + \frac{1}{h_c + h_r}} \qquad (2)$$

where h_i = coefficient of heat transfer from the fluid contents to the tank wall, Btu per (hr) (sq ft) (F); A_w = inside area of tank, sq ft; L_w and L_1 = thickness of the tank and insulation, respectively, in.; k_w and k_1 = thermal conductivity of the tank wall and insulation, respectively, Btu per (hr) (sq ft) (F per in.); A_1 = mean area of insulation, sq ft; h_c and h_r = convection and radiation coefficients, respectively, from surface to surroundings, Btu per (hr) (sq ft) (F). For tanks of reasonable size, 24 in. diameter and larger, A_w, A_1, and A are approximately equal, and Eq. (2) reduces to:

$$U = \frac{1}{\frac{1}{h_i} + \frac{L_w}{k_w} + \frac{L_1}{k_1} + \frac{1}{h_c + h_r}} \qquad (3)$$

Although the heat transfer coefficient from the fluid contents to the tank wall can be evaluated by the data in the literature (7, 15), it is usually so large that the term $1/h_i$ can be neglected in Eq. (3). Likewise, except in the case of non-metallic tanks, which are usually uninsulated, the quantity L_w/k_w is usually very small, so that Eq. (3) can be reduced to:

$$U = \frac{1}{\frac{L_1}{k_1} + \frac{1}{h_c + h_r}} \qquad (4)$$

If the tank is metallic and is uninsulated, Eq. (4) can be reduced without serious error to:

$$U = h_c + h_r \qquad (5)$$

Thus, it is usually only necessary to estimate h_c, h_r, L_1, and k_1 to evaluate U. The thickness of the insulation is usually known. The thermal conductivity of the insulation can be obtained from trade literature and other sources (1, 13, 14). The conductivity of a few of the more common insulating materials is given in Table 1. For accurate results, the thermal conductivity should be evaluated at the average temperature of the insulation, which will be about the average of the temperatures within and outside the tank.

The convection heat transfer coefficient, h_c, depends upon the velocity of the air past the tank. This coefficient is shown as a function of air velocity in Fig. 2, which is based upon a modification of relationships developed by Jurges (10). It is believed to be reliable within ± 20% for air temperatures of 0 to 100F.

Although this relationship is indicated to zero velocity, it is not strictly valid at low velocities, particularly with high surface temperatures. For this case, h_c should be estimated from Fig. 3, which shows the coefficient as a function of the difference between the temperature of the surface of the tank or insulation and the surrounding air temperature. The line for vertical surfaces can be used to estimate the coefficient for the entire tank without serious error.

When there is any doubt as to which relationship to use, the coefficient should be estimated from both figures and the higher value used.

The radiation coefficient, h_r, can be estimated from Fig. 4, which gives the quantity h_r/ϵ as a function of the tank or insulation surface temperature and the temperature of the surrounding air. The quantity, ϵ, is the emissivity of the tank or insulation surface. Values of this property for some typical surfaces are given in Table 2. More complete tables of emissivities are available (1, 13, 14).

It is to be noted that both h_c, as obtained from Fig. 3, and h_r depend upon the temperature of the surface exposed to the surroundings and not primarily upon the temperature within the tank. When the tank is metallic and uninsulated, the surface temperature can be assumed to be the temperature within the tank without significant error. However, if the tank is non-metallic or is insulated, the surface temperature must be estimated, after which the individual and overall coefficients are evaluated and the estimated temperature checked by the following equation:

$$t_s = t_i - (t_i - t_a)\left(\frac{UL_1}{k_1}\right) \qquad (6)$$

where t_s = surface temperature of insulation, F; t_i = temperature of tank contents F; and t_a = temperature of surroundings, F. If the assumed surface temperature differs substantially from that calculated by Eq. (6) then h_c and h_r should be re-evaluated on the basis of this new temperature and U recalculated.

Calculation of Heat Loss

After U has been evaluated by Eq. (4) or (5), it may be substituted in Eq. (1) and the total heat loss calculated. Thus, the following procedure can be used to calculate heat losses from unexposed surfaces:

1. Estimate the surface temperature of the tank or insulation surrounding it. If the tank is uninsulated and metallic it can be assumed to be the temperature inside the tank.
2. Obtain the surface emissivity, ϵ, from Table 2 or other sources.
3. Obtain h_r from Fig. 4 and the emissivity.
4. Obtain h_c from Fig. 2.
5. Obtain h_c from Fig. 3. If larger than that obtained from Fig. 2, use this value. If not, use the value from Fig. 2.
6. From Table 1 or other sources obtain the value for the thermal conductivity of the insulation. Disregard if there is no insulation.
7. Evaluate k_1/L_1.
8. Evaluate U from Eq. (4) or Eq. (5).
9. Calculate surface temperature from Eq. (6) and re-evaluate U if initial guess was incorrect.
10. Calculate overall heat loss from Eq. (1).

The following examples are given to illustrate this procedure:

EXAMPLE 1: A closed, unpainted, stainless steel kettle, 4 ft in diameter, and having an exposed area of 100 sq ft is maintained at 130F by steam coils. It is located in still air having an average temperature of 60F and is uninsulated. What will be the heat loss from this vessel?

SOLUTION: Since the tank is metallic, the outside surface will be assumed to be at 130F. From Table 2, the emissivity, ϵ, of the outside surface is about 0.4. from Fig. 4, $h_r/\epsilon = 1.14$. Thus,

$h_r = (0.4)(1.14) = 0.46$ Btu per (hr)(sq ft)(F)

From Fig. 3, $h_c = 0.76$ Btu per (hr)(sq ft)(F) for a temperature difference of 130-60 = 70F and

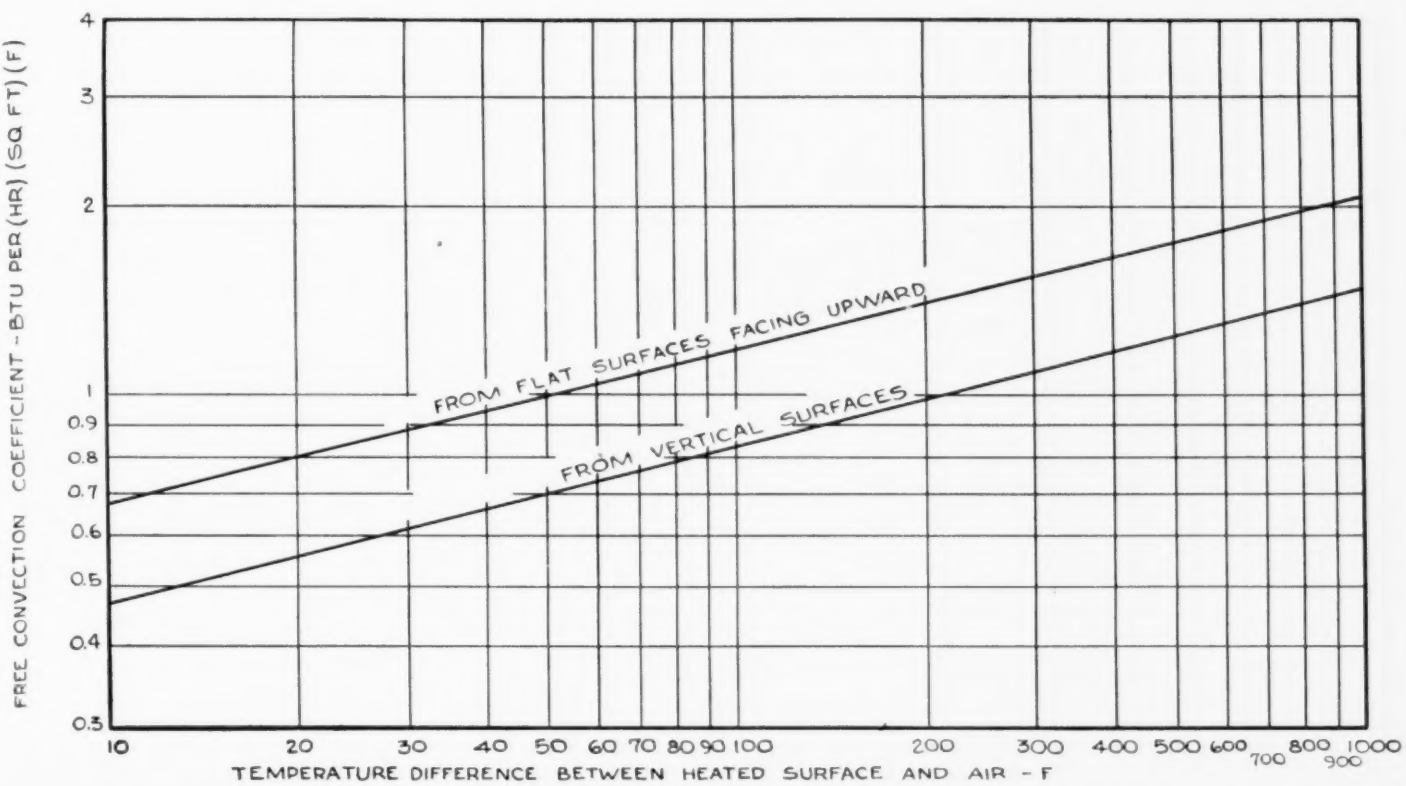


Fig. 3. Free convection coefficients from flat surfaces to air.

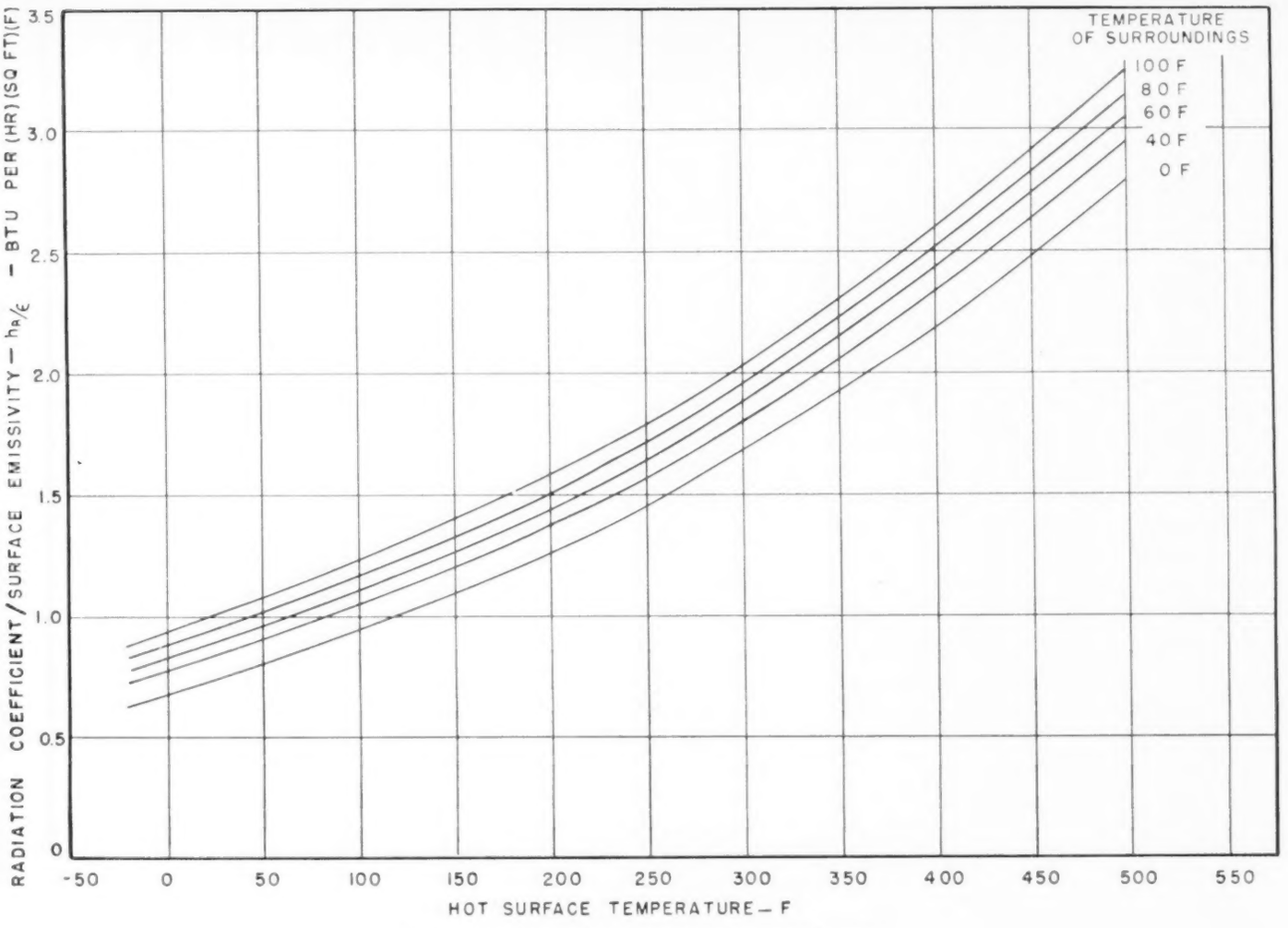


Fig. 4. Heat transfer coefficient from radiation.

$U = 0.76 + 0.46 = 1.22$ Btu per (hr) (sq ft) (F)

From Eq. (1) the total heat loss from the tank will be:

$q = (1.22)(100)(70) = 8{,}540$ Btu per hr.

EXAMPLE 2: A closed iron kettle 3 ft in diameter and having an area of 75 sq ft is maintained at 220F by steam coils. It is insulated with 1 in. of 85% magnesia. It is located in air at 80F which is moving past the tank at about 2 ft per sec. What will be the heat loss from this tank?

SOLUTION: Assume that the surface temperature of the insulation will be 100F. From Table 2, the emissivity, ϵ, is about 0.9. From Fig. 4, $hr/\epsilon = 1.16$, and

$h_r = 0.9\ (1.16) = 1.04$ Btu per (hr) (sq ft) (F)

From Fig. 2, $h_c = 1.50$ Btu per (hr) (sq ft) (F). Since h_c from Fig. 3 is 0.55 Btu per (hr) (sq ft) (F), that from Fig. 2 is used. From Table 1, $k_1 = 0.45$ Btu per (hr) (sq ft) (F per in.) and $k_1 L_1 = 0.45/1 = 0.45$.

The overall heat loss coefficient then from Eq. (4) is

$$U = \frac{1}{\frac{1}{0.45} + \frac{1}{1.14 + 1.50}}$$

$= 0.384$ Btu per (hr) (sq ft) (F)

The assumed surface temperature is checked by Eq. (6)

$t_s = 220 - (220\text{-}80)(0.384)/(0.45) = 100.5$F.

This is sufficiently close to the assumed value that h_c and h_r need not be recalculated.

The temperature difference is 220-80 = 140F. From Eq. (1) the heat loss will be:

$q = (0.384)(75)(140) = 4030$ Btu per hr.

Losses from Exposed Surfaces

Heat losses from exposed surfaces have not been treated extensively in the literature. Goldstern (8) has presented charts giving heat losses from open hot-water vessels. It is believed that these charts are based on previous work by Boehm (2, 3). Bowen (5) has analyzed heat losses from a large body of water and Koritnig (11) has studied the consumption of heat in dyeing operations. Although some of the previous work has direct application to heat losses from tanks, in many cases the application is limited and in others, the assumptions and relationships used to derive the heat loss equations are not strictly valid.

At a free liquid surface, heat will be lost or gained by convection from the surface, radiation from the surface and evaporation or condensation of the liquid. This can be expressed by the following equation:

$$q = (h_c + h_r) A (\triangle t) + E\lambda A \qquad (7)$$

where E = evaporation rate, lbs per (hr) (sq ft); λ = the latent heat of vaporization at the temperature of the liquid, Btu per lb.

The relationships given under Losses from Unexposed Surfaces will suffice to estimate heat loss or gain by convection or radiation. Fig. 2 or 3 (upper line) can be used to estimate convection losses while Fig. 4 can be used for radiation losses. The emissivity of liquid surfaces can be assumed to range from 0.90 to 0.98.

Since evaporation into still air does not occur by quite the same physical phenomenon as evaporation into moving air, different relationships must be used for the two cases. The work of Boelter, Gordon, and Griffin (4) can be used to estimate evaporation losses from liquid surfaces into still air. This relationship, in a modified form, is as follows:

$$E = 0.00084\left(\frac{D_v}{\mu}\right)^{0.25}(p_v - p_a)^{1.25}(M_a - M_v)^{0.25}(M_v) \quad (8)$$

where D_v = diffusion coefficient of the evaporating vapor in air at the average of the air and liquid temperature, sq ft per hr; μ = viscosity of the air-vapor mixture at the average of the air and liquid temperature, lb per (ft) (hr); p_v and p_a are the vapor pressure of the evaporating liquid at the temperature of the liquid and in the air respectively, in. of mercury; and M_a and M_v = the molecular weight of the air (28.8) and the evaporating liquid, respectively. In Eq. (8) positive values of the difference between p_v and p_a and the difference between M_a and M_v must be used to evaluate E, at the same time noting that if p_v is larger than p_a evaporation occurs and if p_v is less than p_a, condensation occurs.

For the case of water evaporating into air, Eq. (8) can be approximated by:

$$E = 0.067\ (p_v - p_a)^{1.22} \quad (9)$$

The effect of air flowing parallel to a liquid surface at various rates on the rate of evaporation of the liquid has been studied extensively (9, 12, 16, 18) and the factors influencing the evaporation have been satisfactorily correlated. These studies, however, have primarily concerned themselves with idealized flow conditions over the liquid surface. Such conditions are almost never met at exposed liquid surfaces in tanks. Since the correlation of Jurges (10) for heat transfer from flat surfaces is generally applicable for practical conditions, it is believed that analogous equations for evaporation derived from Jurges' work by the Chilton-Colburn analogy (6) will probably closely approximate the evaporation rates encountered under ordinary conditions. Thus, depending upon the magnitude of the velocity of air over the liquid surface, one of the two following equations can be used to calculate the rate of evaporation from a liquid surface exposed to air blowing over it:

For $V\rho/\mu$ less than 30

$$E = \left(0.460 + 0.0693\,\frac{V\rho}{\mu}\right) M_v D_v^{2/3}\left(\frac{\mu}{\rho}\right)^{1/3} \times \log\left(\frac{30 - p_a}{30 - p_v}\right) \quad (10)$$

For $V\rho/\mu$ greater than 30

$$E = 16.2\left(\frac{V\rho}{\mu}\right)^{0.78} M_v D_v^{2/3}\left(\frac{\mu}{\rho}\right)^{1/3} \times \log\left(\frac{30 - p_a}{30 - p_v}\right) \quad (11)$$

In the above equations, which check closely the results obtained by several investigators (9, 12, 16, 18), V = velocity of the air across the surface in ft per sec; ρ = density of the air flowing over the surface in lb per cu ft; μ = viscosity of the air flowing over the surface in lb per (ft) (hr) = 2.42 centipoises; E, M_v, D_v, p_a and p_v were previously defined.

To aid in evaluating Eq. (9), (10), and (11), Table 3 is presented which gives the viscosity of air as a function of temperature. Similarly, Table 4 lists the diffusion coefficients in air of some of the more common vapors at several temperatures.

The foregoing equations assume that the only condensable component in the air above the liquid surface is the fluid being evaporated. This is strictly true only when water is the fluid being evaporated. Since the humidity of the air may become appreciable under

Table 3 — Viscosity of Air as a Function of Temperature

Temperature F	Viscosity lb per (ft) (hr)
0	0.039
50	0.042
100	0.044
200	0.049
400	0.060
800	0.079

From J. H. Perry "Chemical Engineers' Handbook," p. 790. McGraw-Hill Book Co., Inc., 1941.

Table 4 — Diffusion Coefficients of Various Vapors into Air

Vapor	Diffusion Coefficient—sq ft per hr 0F	100F	200F
Acetic Acid	0.36	0.53	0.74
Acetone*	0.29	0.39	0.49
Aniline	0.21	0.31	0.42
Benzene	0.26	0.39	0.54
Carbon tetrachloride*	0.22	0.29	0.37
Ethyl acetate	0.24	0.36	0.50
Ethyl alcohol	0.34	0.51	0.71
Ethylene glycol*	0.29	0.40	0.51
Glycerol*	0.25	0.33	0.42
Hexane*	0.21	0.28	0.36
Methyl alcohol	0.45	0.67	0.92
Perchlorethylene*	0.20	0.28	0.35
Toluene	0.24	0.36	0.49
Trichlorethylene*	0.22	0.30	0.39
Water	0.76	1.07	1.42
Xylene	0.20	0.29	0.38

All values from "International Critical Tables," Vol. V, McGraw-Hill Book Co., Inc., N. Y., 1929, except those marked (*) which were calculated from Gilliland's equation, Ind. Eng. Chem., 26, 516 (1934).

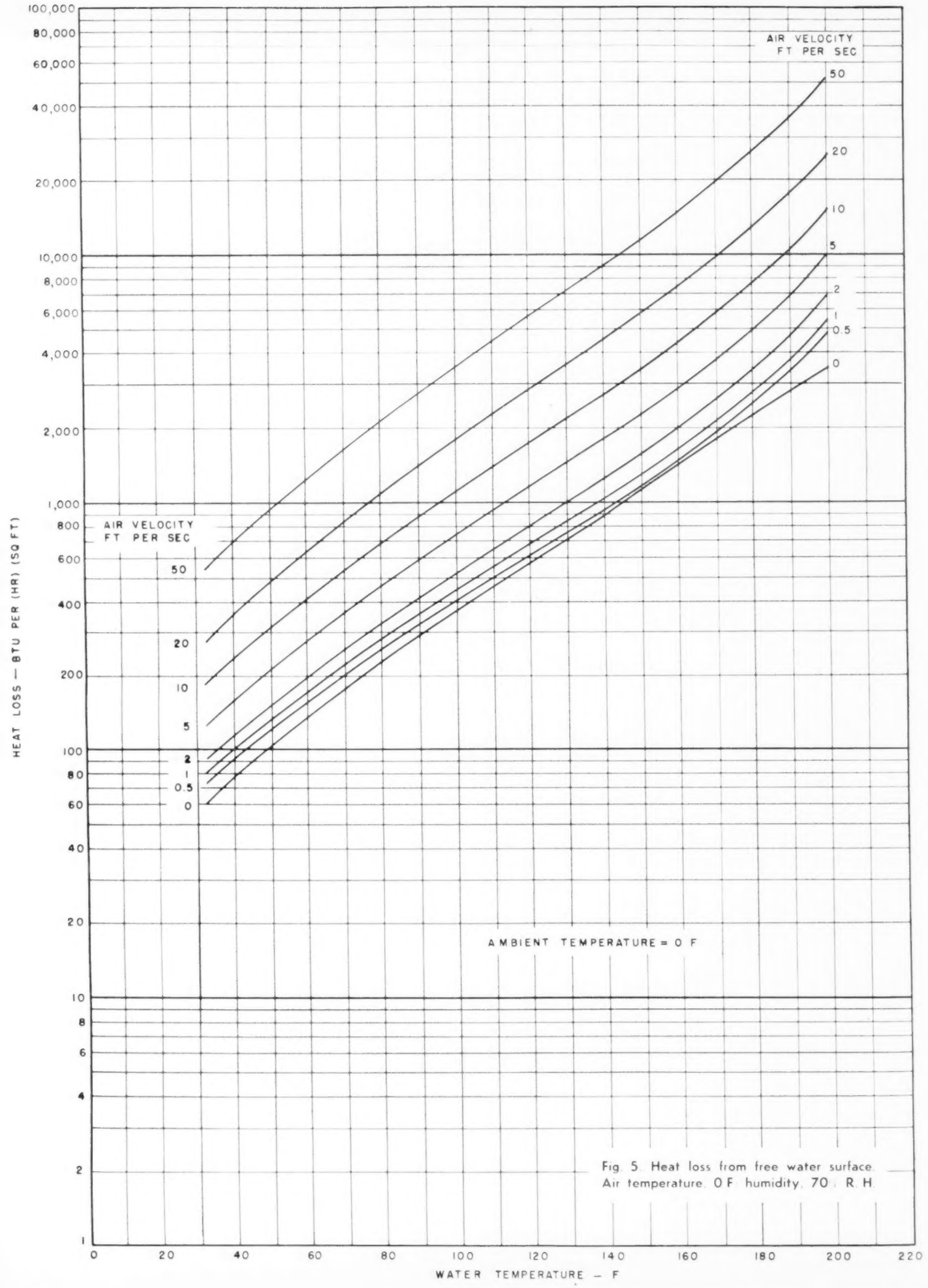


Fig. 5. Heat loss from free water surface. Air temperature, 0 F, humidity, 70% R.H.

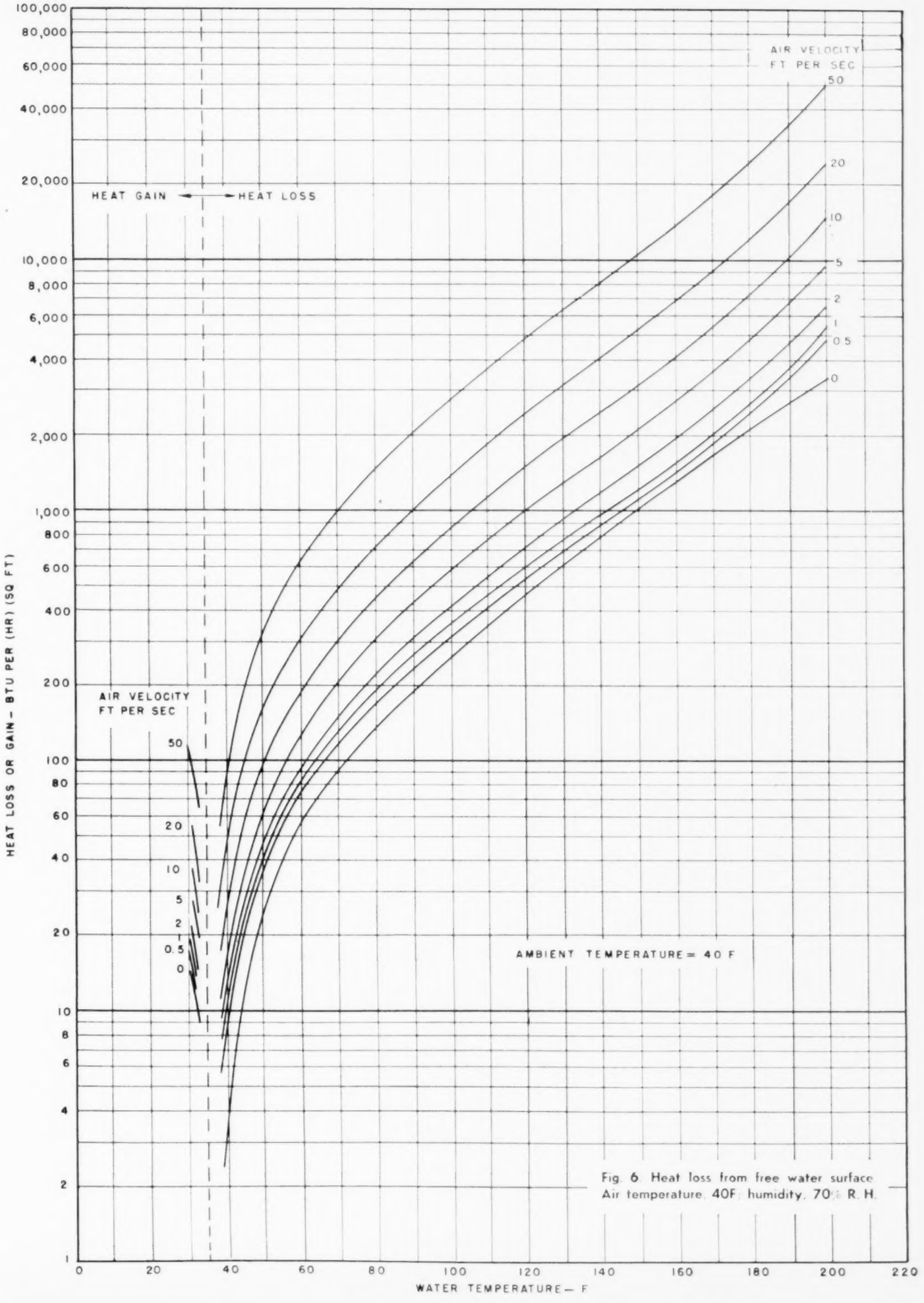


Fig. 6 Heat loss from free water surface. Air temperature, 40F; humidity, 70% R. H.

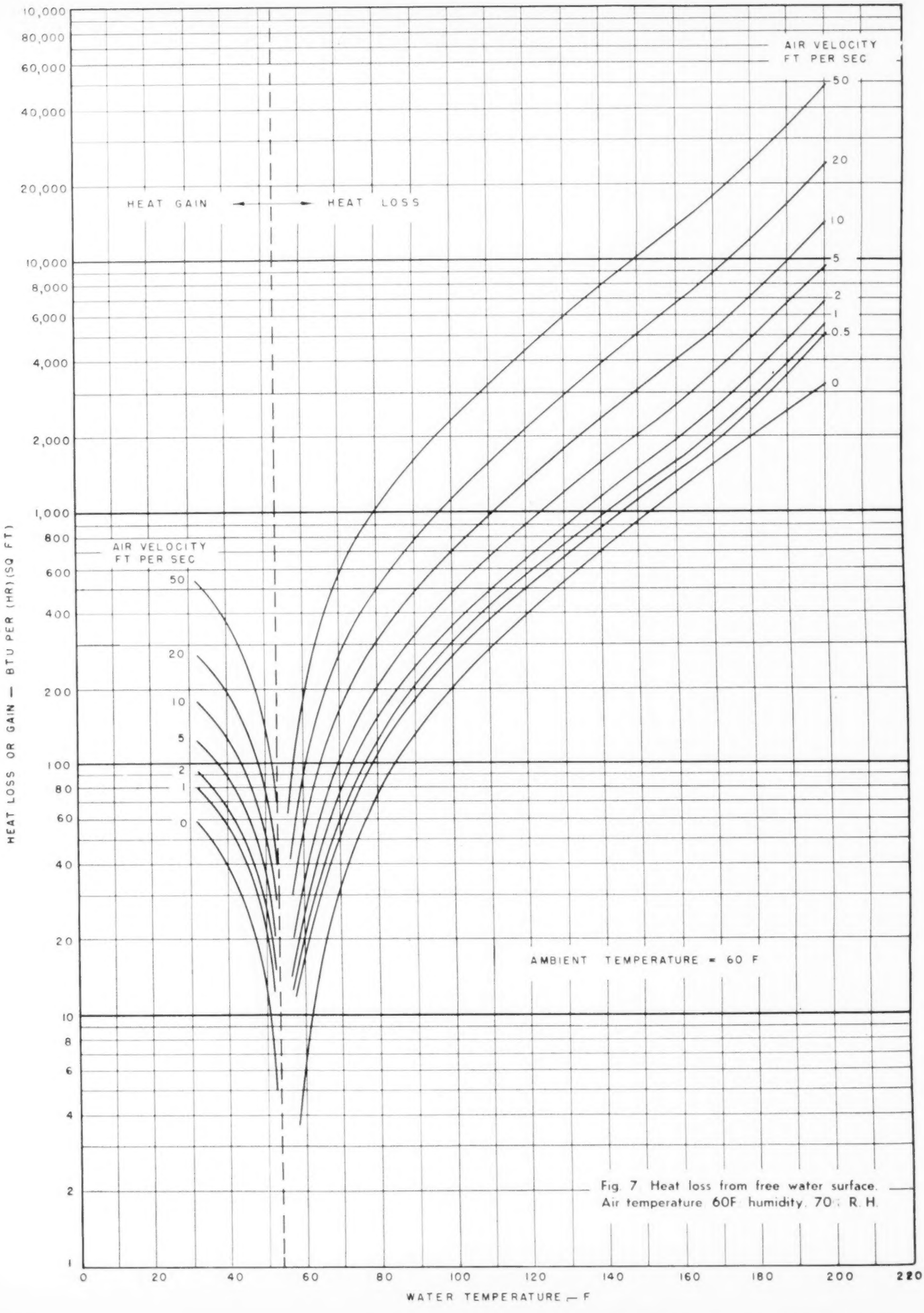


Fig. 7 Heat loss from free water surface. Air temperature 60F, humidity, 70% R.H.

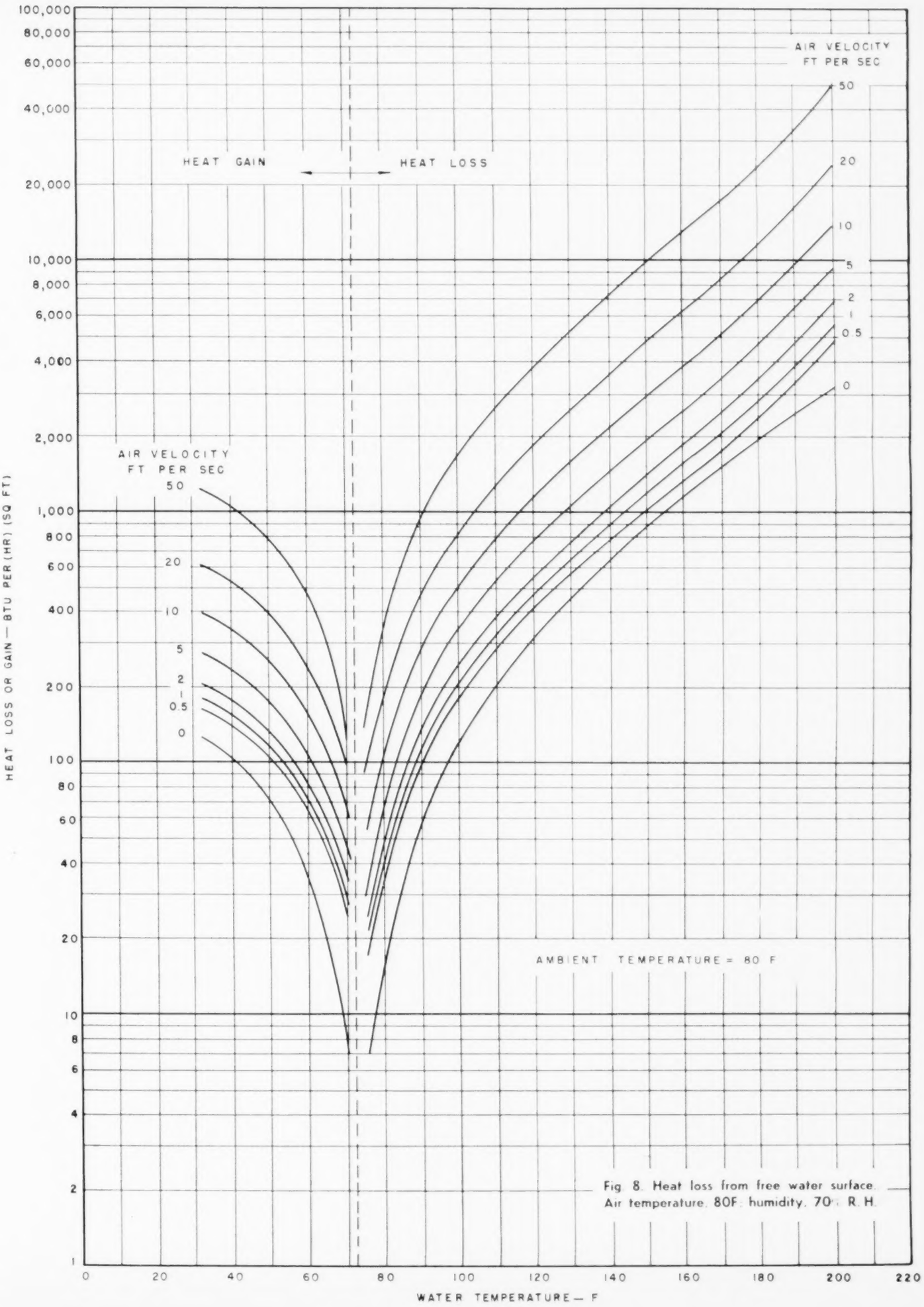


Fig. 8. Heat loss from free water surface. Air temperature, 80F; humidity, 70% R.H.

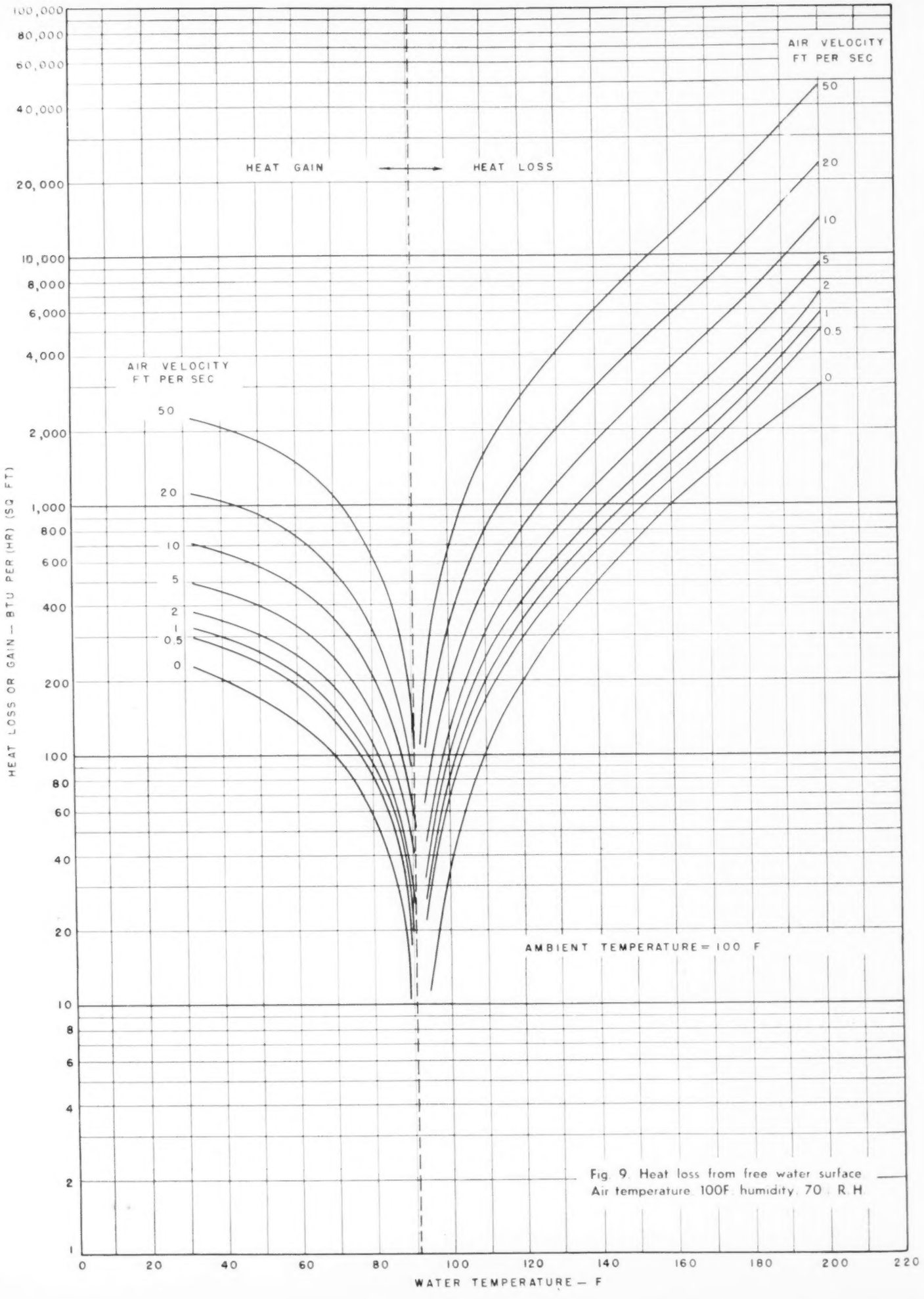


Fig. 9. Heat loss from free water surface. Air temperature 100F, humidity 70% R.H.

summer conditions, p_a may sometimes be greater than p_v, and under these conditions condensation will occur. This condition may be encountered when the exposed surface is below ambient temperature or when the fluid is a concentrated solution.

When applying the foregoing equations to non-aqueous fluids, such as dry-cleaning fluids, ethylene glycol, and alcohol, the quantity p_a can be considered to be negligible, since it is seldom that the air will contain appreciable quantities of these materials. This means that under all conditions, a heat loss caused by evaporation will occur at the surface, even when the surface is below ambient temperature. With these materials, however, the equations are strictly true only when the air is completely dry. If the air contains moisture, it may condense at the exposed surface causing a heat gain at the surface. This will cause a serious error only when the surface temperature is below the ambient temperature, under which conditions the heat gain may be much greater than would be expected with dry air. For these conditions an approximate correction can be applied by using Eq. (7), (8), or (9) to calculate the heat gain which would occur if water with zero vapor pressure instead of the non-aqueous fluid were the fluid in question and adding this quantity to the heat gain to the exposed non-aqueous surface obtained by considering the air to be dry.

Calculations for an Exposed Surface

The steps to be used in calculating the heat loss or gain from an exposed surface can be listed as follows:

1. Knowing the surface and air temperatures, obtain h_c from Fig. 2 or 3.
2. Likewise, obtain h_r from Fig. 4, assuming $\epsilon =$ 0.90 to 0.98.
3. Calculate the evaporation rate from Eq. (8) or Eq. (9) if the vessel is in still air.
4. If the vessel is in moving air, calculate the quantity $V\rho/\mu$. If it is less than 30, use Eq. (10) to calculate the evaporation rate. If it is greater than 30, use Eq. (11).
5. Knowing the quantities, h_c, h_r, A, $\triangle t$, E, and λ, substitute these in Eq. (7) to determine the overall heat loss. Note that a negative sign should be attached to E if condensation occurs.
6. If the liquid being considered is not water and is below the ambient temperature, calculate the condensation rate of water from Eq. (9) (10), or (11) (whichever is applicable) and add this to the quantity obtained from Eq. (7). Note that this will always be a negative quantity.

Since water is probably the fluid most often encountered, design charts have been prepared by means of which the heat loss from exposed surfaces can be obtained directly if the water temperature, air temperature, and air velocity are known. These are shown in Figs. 5, 6, 7, 8, and 9 where the heat loss or gain is given as a function of water temperature for a number of different air velocities. The five charts give the heat losses occurring for air temperatures of 0, 40, 60, 80 and 100F. These charts are based on the foregoing equations and upon a relative humidity of the air of 70%. Although based on 70% relative humidity for the air, they can be safely used for all humidities when the water temperature is greater than 150F. For water temperatures less than 150F and air humidities significantly different from 70%, to avoid serious errors, it is necessary to calculate the heat loss from the equations which have been given.

The following examples illustrate the use of the equations and charts which have been presented:

EXAMPLE 3: An open tank 3 ft in diameter containing trichlorethylene is to be maintained at 120F under a hood. The average air velocity in the hood across the liquid is 5 ft per sec. The incoming air is approximately 80F. What will be the heat loss from the surface of the tank?

SOLUTION: At an air temperature of 80F, a surface temperature of 120F, and an air velocity of 5 ft per sec, from Fig. 2, $h_c = 2.25$ Btu per (hr) (sq ft) (F). From Fig. 4, $h_r/\epsilon = 1.14$. Assuming $\epsilon = 0.95$, then $h_r = (0.95)\ (1.14) = 1.08$ Btu per (hr) (sq ft) (F).

Since the air is moving across the surface, either Eq. (10) or (11) will apply. The density of the air flowing across the surface will be

$$\rho = 0.081 \left(\frac{492}{460 + t_a} \right) = 0.081 \left(\frac{492}{460 + 120} \right)$$
$$= 0.0687 \text{ lb per cu ft}$$

where 0.081 = density of air at 32F. From Table 3, the viscosity of the air is estimated to be 0.043 lb per (ft) (hr). The quantity $V\rho/\mu$ can be evaluated

$$\frac{V\rho}{\mu} = \frac{(5)\ (0.0687)}{(0.043)} = 7.99$$

Since this quantity is less than 30, Eq. (10 will be used to estimate the evaporation rate. From Table 4, the diffusion coefficient is estimated to be 0.30 sq ft per hr at 120F. Since no trichlorethylene will be in the air passing over the surface, $p_a = 0$. The vapor pressure of trichlorethylene at 120F is found to be 8.5 in. of mercury, and the molecular weight is 131.4. Substituting these data in Eq. (10)

$$E = [0.460 + 0.0693\ (7.89)]\ (131.4)\ (0.30)^{2/3} \times \left(\frac{0.043}{0.067} \right)^{1/3} \log \left(\frac{30 - 0}{30 - 8.5} \right)$$
$$= 7.70 \text{ lb per (hr) (sq ft)}$$

Now Eq. (7) will be used to determine the total heat lost from the surface. The latent heat of vaporization of trichlorethylene is 120 Btu per lb at 120F. The area exposed is $(\pi/4)\ (3)^2 = 7.07$ sq ft. The total lost is then:

$$q = (2.25 + 1.08)\ (7.07)\ (120–80) + 7.70\ (120)\ (7.07)$$
$$= 940 + 6530 = 7470 \text{ Btu/hr}$$

From this example it can be seen that the heat lost by evaporation will be the major part of the heat lost.

EXAMPLE 4: A vat 10 ft in diameter, containing essentially water is maintained at 160F. Air at 60F and about 70% relative humidity passes over this vat at about 2 ft per sec. What will be the heat loss from the surface of the vat?

SOLUTION: From Fig. 7, the heat loss per square foot of exposed surface is found to be 2,000 Btu per (hr) (sq ft). The exposed surface is $(\pi/4)\ (10)^2 = 78.5$ sq ft. The total heat loss from the exposed surface equals (78.5) (2000) = 157,000 Btu per hr.

Losses from Air Agitation

If air is used to agitate tanks a heat loss or gain is incurred since the air will tend to approach an equilibrium condition with the fluid being agitated. In general, since compressed air (which usually contains only a small amount of moisture) is used, there will always be evaporation of the fluid into the air causing a heat loss. Depending upon whether the air is above or below the fluid temperature, there will be a heat loss or gain caused by bringing the air to the fluid temperature. Although the degree to which the air will approach saturation and the fluid temperature during its passage through the tank is a complex function of many variables (bubble size, liquid surface tension, height of rise, etc.) it is believed that safe designs can be based on the assumptions that the air will leave the tank at the liquid temperature and will be 90% saturated with the liquid. Thus, the heat loss can be expressed by the following equation:

$$q = G_a\ c_p\ (t_l - t_a) + E'G_a \qquad (12)$$

where G_a = total air rate through the tank expressed as lb per hr; c_p = specific heat of air, Btu per (lb) (F) = 0.24; t_l = temperature of fluid, F; t_a = temperature of incoming air, F; E' = evaporation into the air expressed as lb per (lb of air). Assuming 90% equilibrium when the air leaves,

$$E' = \frac{0.9\ p_v}{(30 - 0.9\ p_v)}\left(\frac{M_v}{28.8}\right) \qquad (13)$$

where p_v = vapor pressure of the tank fluid at the temperature of the tank, in. of mercury, and M_v = the molecular weight of the tank fluid.

For the case of water, Fig. 10 has been prepared to show the heat loss per pound of air used for agitation. The following example illustrates the use of these relations:

EXAMPLE 5: Compressed air at the rate of 1000 lb per hr is being used to agitate a vat containing ethylene glycol at 200F. If the air temperature is 60F what will be the approximate loss of ethylene glycol and the approximate heat loss?

SOLUTION: Equation (13) will be used to estimate the glycol loss. From suitable charts the vapor pressure, p_v, of glycol at 200F is found to be 0.512 in. of mercury. The molecular weight is 62.1.

$$E' = \frac{(0.9)\ (0.512)}{[30 - 0.9\ (0.512)\ ]}\left(\frac{62.1}{28.8}\right)$$
$$= 0.0336 \text{ lb per (lb air)}$$

Total glycol lost = (1000) (0.0336) = 33.6 lb per hr.

Equation (12) is used to estimate the heat loss. The latent heat of vaporization of glycol at 200F is found to be 450 Btu per lb.

$$q = (1000)\ (0.24)\ (200–60) + (33.6)\ (450)$$
$$= 33{,}600 + 15{,}100 = 48{,}700 \text{ Btu per hr}$$

General Examples

The overall heat losses will always be the sum of the heat losses from the unexposed and exposed surfaces and the air agitation if it is used. The following examples will illustrate the combined use of the preceding charts and equations:

EXAMPLE 6: A chill-bath of water is to be maintained at 38F by brine coils submerged in the tank. It is to be agitated by sparging with air. The tank is 4 ft wide, 12 ft long, 2 ft high and insulated with 2 in. of cork insulation covered with asphalt mastic. It will be filled to a height of 1 ft. Air will be sparged into the tank at the rate of 15 lb per hr. This tank will be exposed to air at 60F and 70% relative humidity passing over it at the average rate of 2 ft per sec. How much heat will be gained by the bath from its surroundings?

SOLUTION: *A. Heat loss from unexposed surface*

The unexposed area = 2 (4.33) (2.17) + (4.33) (12.33) + 2 (12.33) (2.17) = 126 sq ft.

Assume the surface temperature = 57F, then from Table 2, $\epsilon = 0.95$ and from Fig. 4, $h_r/\epsilon = 0.97$. Then h_r = (0.97) (0.95) = 0.92 Btu per (hr) (sq ft) (F). From Fig. 2, $h_c = 1.5$ Btu per (hr) (sq ft) (F). Since this is larger than will be obtained from Fig. 3, it will be used. From Table 1, the thermal conductivity of cork = 0.25 Btu per (hr) (sq ft) (F per in.). Thus, $k_1/L_1 = 0.25/2 = 0.125$ and from Eq. (4)

$$U = \frac{1}{\frac{1}{0.125} + \frac{1}{0.92 + 1.5}}$$
$$= 0.119 \text{ Btu per (hr) (sq ft) (F)}$$

Checking the assumed surface temperature with Eq. (6)

$t_s = 38 - (38 - 60)\ (0.119)/0.125 = 59$F

This is close enough to the assumed 57F so that recalculation is unnecessary. The heat loss from the unexposed surface is then

$q = (0.119)\ (126)\ (38 - 60) = -330$ Btu per hr

B. Heat loss from exposed surface

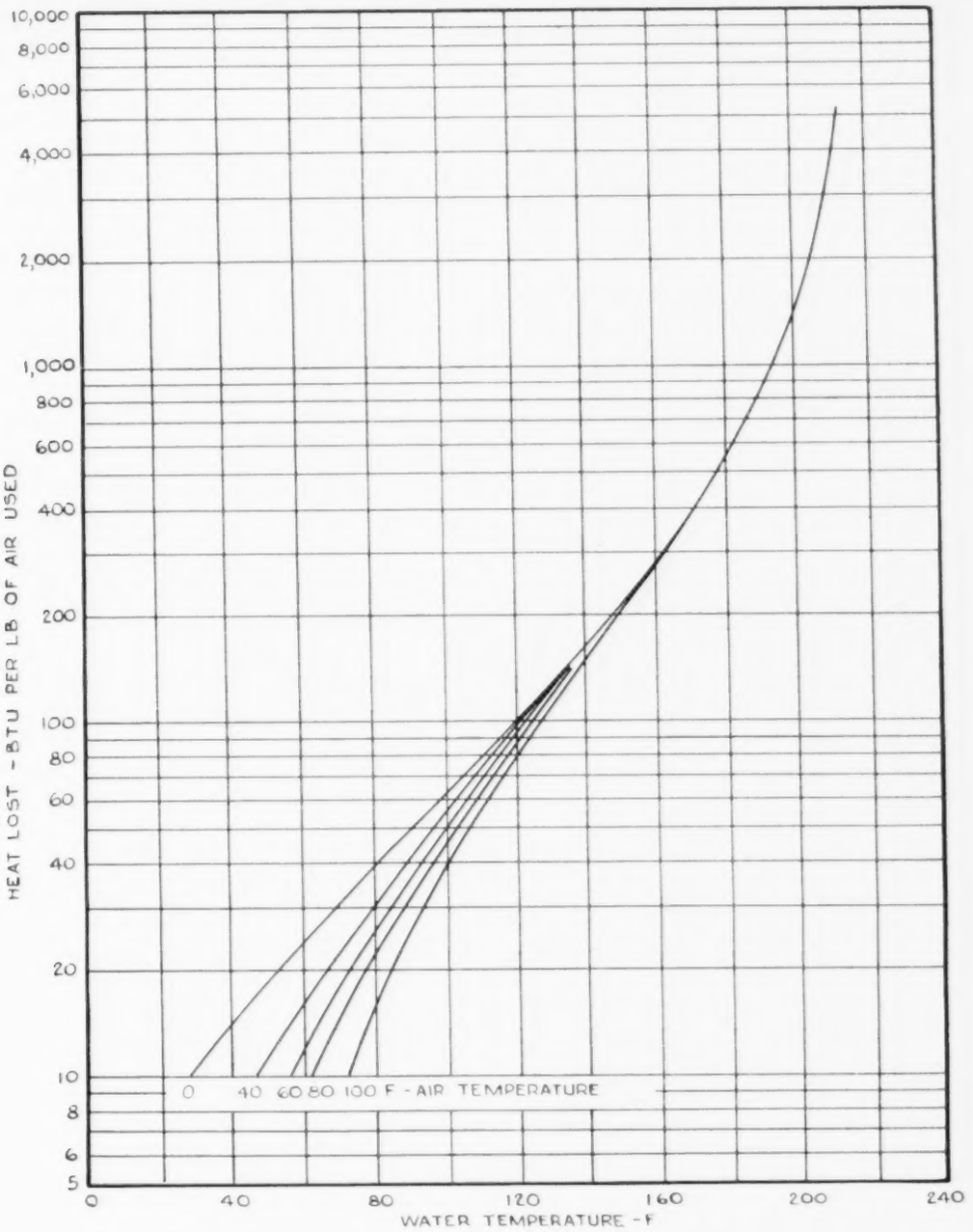
This can be obtained directly from Fig. 7 for a water temperature of 38F and an air velocity of 2 ft per sec and is found to be — 73 Btu per (hr) (sq ft). Since the exposed area = 4 (12) = 48 sq ft, the total loss will be

$q = -73\ (48) = -3500$ Btu per hr

C. Heat loss from air sparging

Since the conditions are out of the range of Fig. 10, Eq. (12) and (13) will be used. From a vapor pressure table for water, $p_v = 0.249$ in. of mercury. Then

Fig. 10. Heat loss to air sparging open tanks.



$$E' = \frac{(0.9)\ (0.249)}{[30-0.9\ (0.249)]}\left(\frac{18}{28.8}\right) = 0.00470 \text{ lb per lb air}$$

From steam tables, λ is found to be 1072 Btu per lb. From Eq. (12) the heat loss is then

$$q = 15\ (0.24)\ (38-60) + 0.00470\ (1072)\ (15)$$
$$= -79 + 76 = -3 \text{ Btu per hr.}$$

D. Total heat loss

The total heat loss is the sum of the three individual losses and is

$q = -330 - 3500 - 3 = -3833$ Btu per hr

Since the heat loss is negative, it is actually a heat gain by the tank.

EXAMPLE 7: A treatment tank containing essentially water is maintained at 130F in a room with relatively still air maintained at about 80F at 70% relative humidity. The tank is of steel, painted with aluminum paint, 40 ft long, 4 ft wide and 2 ft deep. It is agitated by sparging with 25 lb per hr of air. What is the heat loss from the tank.

SOLUTION: *A. Loss from unexposed surfaces*

The unexposed area for heat loss $= (40)\ (4) + 2\ (40)\ (2) + 2\ (4)\ (2) = 336$ sq ft. Since the tank is uninsulated, its surface will be very close to 130F. From Table 2, $\epsilon = 0.5$. From Fig. 4 $h_r/\epsilon = 1.24$ and thus $h_r = (1.25)\ (0.5) = 0.63$ Btu per (hr) (sq ft) (F). The temperature difference $= 130 - 80 = 50$F. From Fig. 3, $h_c = 0.7$ Btu per (hr) (sq ft) (F). Using Eq. (5)

$U = 0.63 + 0.7 = 1.33$ Btu per (hr) (sq ft) (F)

The heat loss is then (Eq. (1).

$q = (1.33)\ (336)\ (50) = 22{,}300$ Btu per hr.

B. Heat loss from exposed surfaces

Fig. 8 will be used to evaluate this. At velocity $= 0$ and 130F water temperature, the loss $= 470$ Btu per sq ft. The exposed area $= (40)\ (4) = 160$ sq ft. The heat loss is then equal to $(470)\ (160) = 75{,}200$ Btu per hr.

Nomenclature

A = area exposed for heat loss, sq ft.
A_l = mean area of insulation, sq ft.
A_w = area of tank wall, sq ft.
c_p = specific heat of air, Btu per (lb) (F).
D_v = diffusion coefficient of evaporating liquid in air, sq ft per hr.
E = evaporation rate, lb per (hr) (sq ft).
E' = evaporation rate, lb per lb of air.
G_s = air rate from sparger, lb per hr.
h_c = convection heat transfer coefficient, Btu per (hr) (sq ft) (F).
h_l = heat transfer coefficient from liquid within tank to tank wall, Btu per (hr) (sq ft) (F).
h_r = radiation heat transfer coefficient, Btu per (hr) (sq ft) (F).
k_l = thermal conductivity of the insulation, Btu per (hr) (sq ft) (F per in.)
k_w = thermal conductivity of the tank wall, Btu per (hr) (sq ft) (F per in.)
L_l = thickness of insulation, in.
L_w = thickness of tank wall, in.
M_a = molecular weight of air, 28.8.
M_v = molecular weight of escaping vapor (for water = 18.0).
p_v = vapor pressure of evaporating liquid at the tank temperature, in. of mercury.
p_a = vapor pressure of evaporating liquid in the air, in.
q = heat loss, Btu per hr.
t_a = air temperature, F.
t_l = temperature of liquid in tank, F.
t_s = temperature of insulation or tank surface exposed to the air, F.
U = overall heat transfer coefficient, Btu per (hr) (sq ft) (F).
V = air velocity, ft per sec.
Δt = F temperature difference, usually $t_l - t_a$.
ϵ = emissivity of radiating surface.
λ = latent heat of vaporization of evaporating liquid, Btu per lb.
μ = viscosity of air, lb per (ft) (hr).
ρ = density of air, lb per cu ft.

C. Heat loss from air sparging

Fig. 10 can be used to estimate this quantity. At a water temperature of 130F and an air temperature of 80F, the loss is 119 Btu per lb of air. Since 25 lb per hr of air are used, this loss is then

$$q = 25\ (119) = 2975 \text{ Btu per hr}$$

D. Total heat loss

The sum of the individual losses is

$q = 22{,}300 + 75{,}200 + 2{,}975 = 100{,}475$ Btu per hr.

Approximately 100 lb of steam will be dissipated per hour in losses.

Summary

Charts and equations have been presented which permit estimation of heat losses from unexposed tanks and kettles. These relationships should be accurate within ± 20%. Likewise, charts have been given which permit the rapid estimation of heat losses from exposed water surfaces to air at 70% relative humidity, temperatures ranging from 0F to 100F, and velocities ranging to 50 ft per sec. In addition, equations have been listed by means of which heat losses from water surfaces to air at other relative humidities and heat losses from aqueous and non-aqueous solutions can be calculated. It is believed that if these charts or equations err it is on the conservative side. For well-mixed, exposed tanks, the results should be within 25%. If the tanks are not mixed and thermal non-uniformity exists in them, the temperature of the exposed surface will probably be less than the average tank temperature with the result that the heat loss may be significantly less than indicated by these charts and equations. No known method exists for accurately estimating heat losses when the tanks are unmixed. The equations and graphs presented for heat losses to sparging air are least accurate and may be as much as 50% in error. Here again, the error will be on the conservative side.

Examples have been given illustrating the use of the relationships which have been presented. It is believed that these will prove helpful in their correct application.

Since all of the relationships were adapted from work not directly aimed at evaluating heat losses from tanks, it must be realized they represent estimates only. It is hoped that actual data on large tanks will be presented in the literature in the not too distant future so that the relationships presented herein can be confirmed experimentally.

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DISTRIBUTION OF HEATING LOADS BY MONTHS

The accompanying table gives the percentage of total heating load occurring in the various months. The percentage was obtained by dividing the normal number of degree-days for each month by the normal seasonal total of degree-days. Thus the table shows, for example, what per cent of the annual fuel consumption (for heating, not including hot water) can be expected in any given month.

As an example, in Washington, D. C., November normally accounts for 12% of the annual load. Cumulatively, by the end of December, 1 + 6 + 12 + 19 or 38% of the normal seasonal yearly total will be used.

PER CENT OF HEATING LOAD BY MONTHS IN NORMAL YEAR

State and City	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
ALABAMA												
Anniston	..	..	5	14	21	22	18	13	8	1	..	..
Birmingham	..	..	4	13	22	23	20	12	5	1	..	..
Mobile	..	..	3	13	24	25	20	12	3	..	..	..
Montgomery	..	..	4	13	23	24	20	12	4	..	..	..
ARIZONA												
Flagstaff	1	3	8	13	15	16	13	12	9	6	3	1
Phoenix	..	..	1	12	27	28	18	11	3	..	..	..
Yuma	..	..	1	12	30	31	16	8	2	..	..	..
ARKANSAS												
Bentonville	..	..	6	13	20	22	18	13	6	2	..	..
Fort Smith	..	..	4	13	22	24	19	12	5	1	..	..
Little Rock	..	..	4	13	23	23	19	12	5	1	..	..
CALIFORNIA												
Eureka	6	6	7	9	11	11	10	11	9	8	6	6
Fresno	..	..	3	13	24	24	16	12	6	2	..	..
Independence	..	1	6	13	20	21	16	13	7	3	..	..
Los Angeles	..	..	3	8	16	20	17	15	11	8	2	..
Redding	..	2	4	13	21	22	15	13	7	3	..	..
Sacramento	..	1	4	12	22	22	15	12	7	4	1	..
San Francisco	6	4	4	8	14	14	11	10	9	8	6	6
San Diego	..	1	4	9	16	19	16	14	11	7	3	..
COLORADO												
Denver	..	2	8	12	17	17	15	14	9	5	1	..
Durango	1	3	7	12	17	18	15	12	7	6	2	..
Grand Junction	..	1	6	13	15	22	16	12	8	3	4	..
Leadville	3	5	8	11	13	14	12	12	9	7	4	2
Pueblo	..	2	7	13	19	19	15	13	8	3	1	..
CONNECTICUT												
Hartford	..	2	6	11	17	19	17	14	9	4	1	..
New Haven	..	2	6	11	17	19	17	14	9	4	1	..
DISTRICT OF COLUMBIA												
Washington	..	1	6	12	19	20	18	14	8	3	..	..
FLORIDA												
Appalachicola	..	..	2	13	23	25	21	13	3	..	..	..
Jacksonville	..	..	2	12	25	25	21	11	4	..	..	..
Key West	..	..	..	6	24	35	24	11	..	..	..	..
Miami	..	..	..	8	21	29	24	16	2	..	..	..
Pensacola	..	..	2	12	24	25	21	12	4	..	..	..
Tallahassee	..	..	3	13	23	26	20	11	4	..	..	..
Tampa	..	..	1	10	26	28	22	11	2	..	..	..
GEORGIA												
Atlanta	..	..	4	13	21	22	20	13	6	1	..	..
Augusta	..	..	4	14	23	23	19	11	5	1	..	..
Macon	..	..	3	14	23	23	19	12	5	1	..	..
Savannah	..	..	3	14	23	24	20	12	4	..	..	..
Thomasville	..	..	3	14	24	24	20	12	3	..	..	..
IDAHO												
Boise	..	2	7	13	18	19	15	12	8	4	2	..
Pocatello	..	3	7	12	17	18	15	13	8	5	2	..
ILLINOIS												
Cairo	..	1	5	12	21	22	18	13	6	2	..	..
Carbondale	..	1	5	12	21	23	18	12	6	2	..	..
Chicago	..	1	5	12	18	19	17	14	9	4	1	..
Peoria	..	1	6	12	19	22	17	13	7	3	..	..
Springfield	..	1	5	12	19	21	18	13	7	2	..	..

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State and City	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
INDIANA												
Evansville	..	1	6	12	20	21	18	13	7	2	..	..
Fort Wayne	..	2	5	18	17	18	16	13	7	3	1	..
Indianapolis	..	1	5	12	19	20	18	14	8	3	..	..
Royal Center	..	2	6	12	17	20	16	14	8	4	1	..
Terre Haute	..	1	5	12	19	21	18	14	7	3	..	..
IOWA												
Burlington	..	1	3	13	19	22	18	15	7	2	..	..
Charles City	..	2	6	12	18	20	17	13	8	3	1	..
Davenport	..	1	6	12	19	21	18	13	7	3	..	..
Des Moines	..	2	6	12	19	20	18	13	7	3	..	..
Dubuque	..	2	6	12	18	20	17	14	7	3	1	..
Keokuk	..	1	5	12	20	21	19	13	7	2	..	..
Sioux City	..	2	6	12	18	20	18	13	7	3	1	..
KANSAS												
Concordia	..	1	5	13	19	22	18	13	6	3	..	..
Dodge City	..	1	5	13	20	21	17	13	7	3	..	..
Iola	..	1	5	13	20	22	18	13	6	2	..	..
Topeka	..	1	5	12	21	22	18	13	6	2	..	..
KENTUCKY												
Lexington	..	1	5	13	19	20	18	14	7	3	..	..
Louisville	..	1	5	12	20	21	18	13	8	2	..	..
LOUISIANA												
New Orleans	..	..	2	12	25	26	21	11	3	..	..	..
Shreveport	..	..	3	13	23	25	20	12	4	..	..	..
MAINE												
Eastport	2	3	6	10	14	16	15	13	9	6	4	2
Greenville	1	3	7	11	15	18	15	13	9	5	2	1
Portland	1	2	6	11	16	18	16	14	9	5	2	..
Presque Isle	1	3	6	12	16	18	16	13	8	5	2	..
MARYLAND												
Baltimore	..	1	5	12	19	20	19	14	8	2	..	..
MASSACHUSETTS												
Boston	..	2	6	11	17	19	17	14	9	4	1	..
Fitchburg	..	2	6	12	17	18	17	14	9	4	1	..
Nantucket	..	1	6	10	15	17	16	15	12	6	2	..
MICHIGAN												
Alpena	..	3	7	12	15	17	16	14	9	5	2	..
Escanaba	1	3	7	11	15	17	16	13	9	5	2	1
Grand Rapids	..	1	5	12	17	20	18	14	8	4	1	..
Houghton	1	3	6	11	15	17	16	14	9	5	2	1
Lansing	1	2	7	12	17	18	17	14	8	4	..	..
Ludington	1	2	6	11	15	17	16	14	9	6	2	1
Marquette	1	3	6	11	15	17	15	14	9	6	3	..
Sault Ste. Marie	1	3	6	10	15	18	17	14	9	5	2	..
Traverse City	1	2	5	12	15	18	17	15	9	5	1	..
MINNESOTA												
Duluth	1	3	7	11	16	18	15	13	8	5	2	1
International Falls	1	3	7	12	17	18	16	13	8	4	1	..
Minneapolis	..	2	6	12	18	20	17	14	7	3	1	..
Moorhead	1	3	7	12	17	19	16	13	7	4	1	..
Raseau	1	3	7	12	16	18	16	13	9	4	1	..
MISSISSIPPI												
Corinth	..	..	5	14	22	23	17	13	5	1	..	..
Meridian	..	..	4	15	23	24	16	12	5	1	..	..
Vicksburg	..	..	4	13	23	24	20	12	4	..	..	..
MISSOURI												
Columbia	..	1	5	12	20	21	19	13	7	2	..	..
Kansas City	..	1	5	12	20	22	18	13	7	2	..	..
St. Joseph	..	1	5	13	20	22	18	13	6	2	..	..
St. Louis	..	1	5	12	20	22	19	13	6	2	..	..
Springfield	..	1	5	12	20	22	18	13	7	2	..	..

(Concluded on Reference Data Sheet 365-366)

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Graphical Determination of Heat Transfer Film Coefficient for Air

B. F. RABER* and F. W. HUTCHINSON**

THE thirteen articles that have already appeared in this series on heat transfer referred to refrigerants in either liquid or vapor phase. The present installment is likewise for a refrigerant—air—but the applicability of the heat transfer data for this fluid will, doubtless, be wider outside the field of refrigeration than within it. Thus the graphical film coefficient solutions for air can be used in connection with the design of coolers, receivers, or other auxiliaries in a compressed air system as well as in calculating heat transfer rates for dense air refrigeration systems or in analyzing the performance of compressed air engines; in another field, the charts can be used to determine film coefficients for low-pressure air as used in the ducts of ventilating, heating, or air conditioning systems, though applicability to this type of installation is limited by the range of pipe diameters (up to 4 in.) for which the graphs have been drawn.

Fig. 27 is for the turbulent flow of air (no restriction on pressure) within a round tube whereas Fig. 28 is for turbulent air flow outside and normal to a single round tube. Fig. 27 is valid for all air pressures up to 50 lb per sq in. abs; for air at 100 lb per sq in. abs, the minimum weight velocity must be unity, and for air pressure of 200 lb per sq in. abs the minimum weight velocity must be 2. When weight velocities are less than these minimum values the criterion of turbulence is not met hence the graphical solution is not applicable.

In order to use either Fig. 27 or Fig. 28 it is first necessary to calculate the weight velocity, taken as the product of the fluid velocity in feet per *second* and the fluid density in pounds per cubic foot. The density of air can be determined with accuracy adequate for most practical engineering purposes by application of the perfect gas law,

$$w = 2.7p/(t + 460)$$

where w is the weight density (pounds per cubic foot), p is the pressure in pounds per square inch absolute (gage pressure plus 14.7), and t is the temperature of the air in degrees Fahrenheit; this equation is strictly applicable only to dry air, but its use for air containing moisture in the usual range of humidities will be satisfactory. For air at atmospheric pressure and comfort (70F) temperature, the calculated density is .075 lb per cu ft this value can be used in weight velocity determinations for ducts or conduits in which the actual gage pressure is only an inch or two of water.

Example: A $\frac{3}{4}$-in. inside diameter compressed air pipe is heavily insulated and has been out of service in a 50F room for a long period of time so that pipe and room are at the same temperature. Compressed air at 98 lb per sq in. gage and 200F is introduced into the line and flows through it at a velocity of 3,000 fpm. Determine the initial rate of heat loss from the air per lineal foot of pipe and calculate the initial temperature drop of the air in going through the first 10 ft of pipe.

Solution: The density of the compressed air is, $w = 2.7 (98 + 14.7)/(200 + 460) = 46$ lb per cu ft The weight velocity in the pipe is then $(46 \times 3{,}000)/60 = 23$ lb per sec. To determine the inside film coefficient of heat transfer enter Fig. 27 at the bottom for known weight velocity of 23, then rise to the horizontal for a $\frac{3}{4}$-in. I.D. pipe and from here follow a directrix line upward and to the left (see dashed example line on the figure) to the base scale for heat transfer; from this intersection rise vertically to the horizontal for 200F then follow a directrix downward and to the right to intersection with the heat transfer scale at a value of the film coefficient of 52 Btu per (hr) (sq ft) (F).

At the time of start-up the pipe and insulation are at room temperature hence the initial rate of heat loss will be determined wholly by the inside film coefficient; subsequently, as the pipe wall and the insulation rise in temperature, the rate of heat loss will decrease and will eventally reach an equilibrium value as indicated by the overall coefficient of heat transfer from air within the pipe to air in the room. Initially, however, the rate of heat loss will be the product of film coefficient by the difference in temperature between the main body of air in the pipe and the inside surface of the pipe, or:

Initial rate of heat loss $= 52(200\text{-}50)$
$= 7800$ Btu per (hr) (sq ft)

where the unit of area is taken on the inside surface of the pipe. The area of inside surface in 10 lineal feet of $\frac{3}{4}$-in. I.D. pipe is $10 \times 3.1416 \times (.75/12) = 1.965$ sq ft hence the total heat loss *rate* in the first 10 ft of pipe is $1.965 \times 7800 = 15{,}330$ Btu per hr. The flow rate is 23 lb per (sec) (sq ft) or $23 \times .0123 = .283$ lb per sec (where .0123 is the cross-section area of the pipe, in square feet). The hourly flow rate is $3600 (.283) = 1{,}020$ lb per hr hence the *rate* of initial heat loss from the air is $15{,}330/1020 = 15$ Btu per (lb) (hr) and the initial *rate* of temperature drop for the first 10 ft of pipe is approximately $4 \times 15 = 60$F per hr. Actually, of course, the initial rate will fall off rapidly so that in the first hour the average temperature drop of air will be very much less than 60F, but this figure is of interest in showing that, when operation of the system is started, the first few minutes will be a period of surprisingly great heat loss. From the standpoint of practical application this transient condition is of real importance since it indicates a preliminary interval in which condensation may occur within the pipe.

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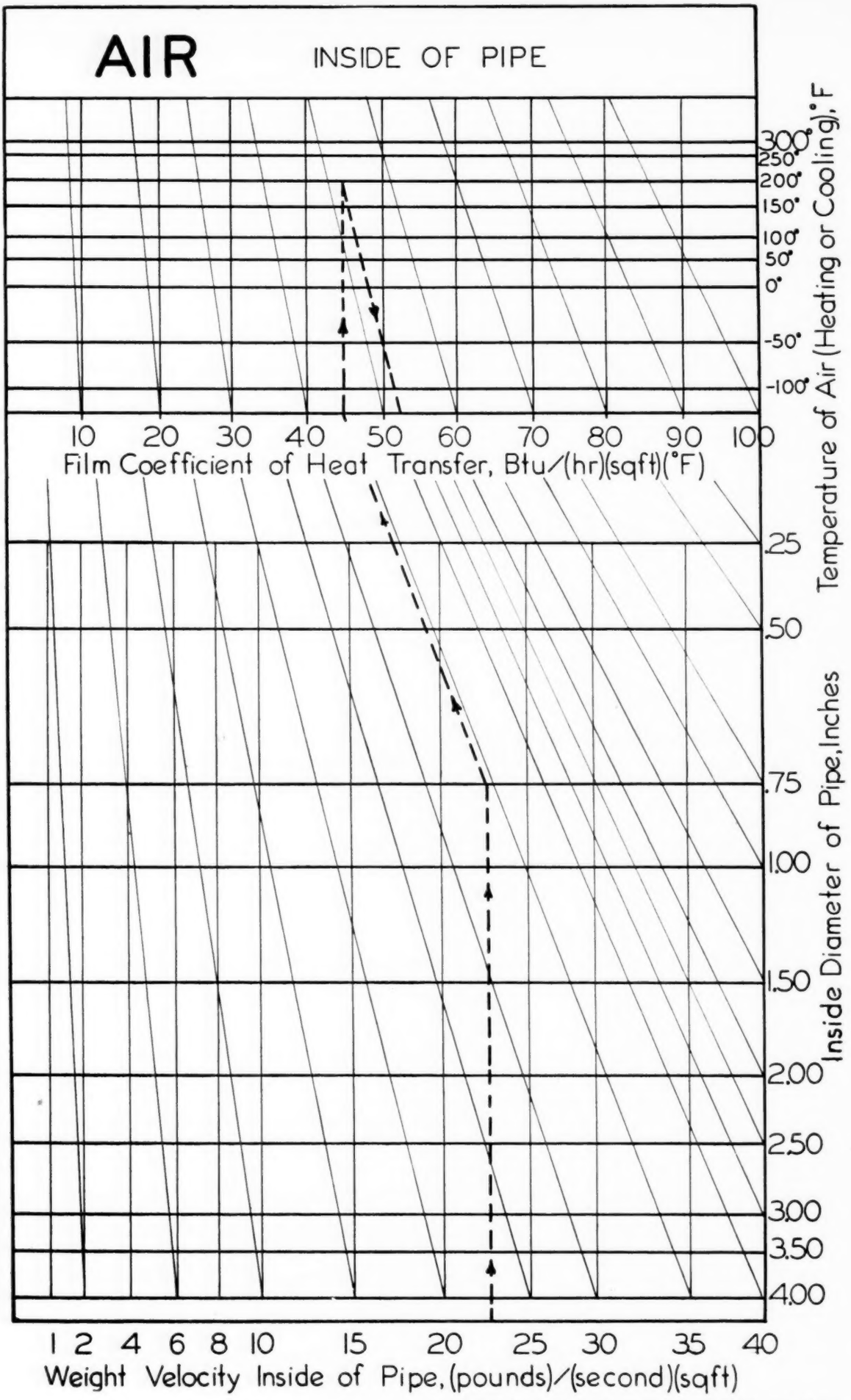

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Fig. 27. Film coefficient for air flowing inside a pipe.

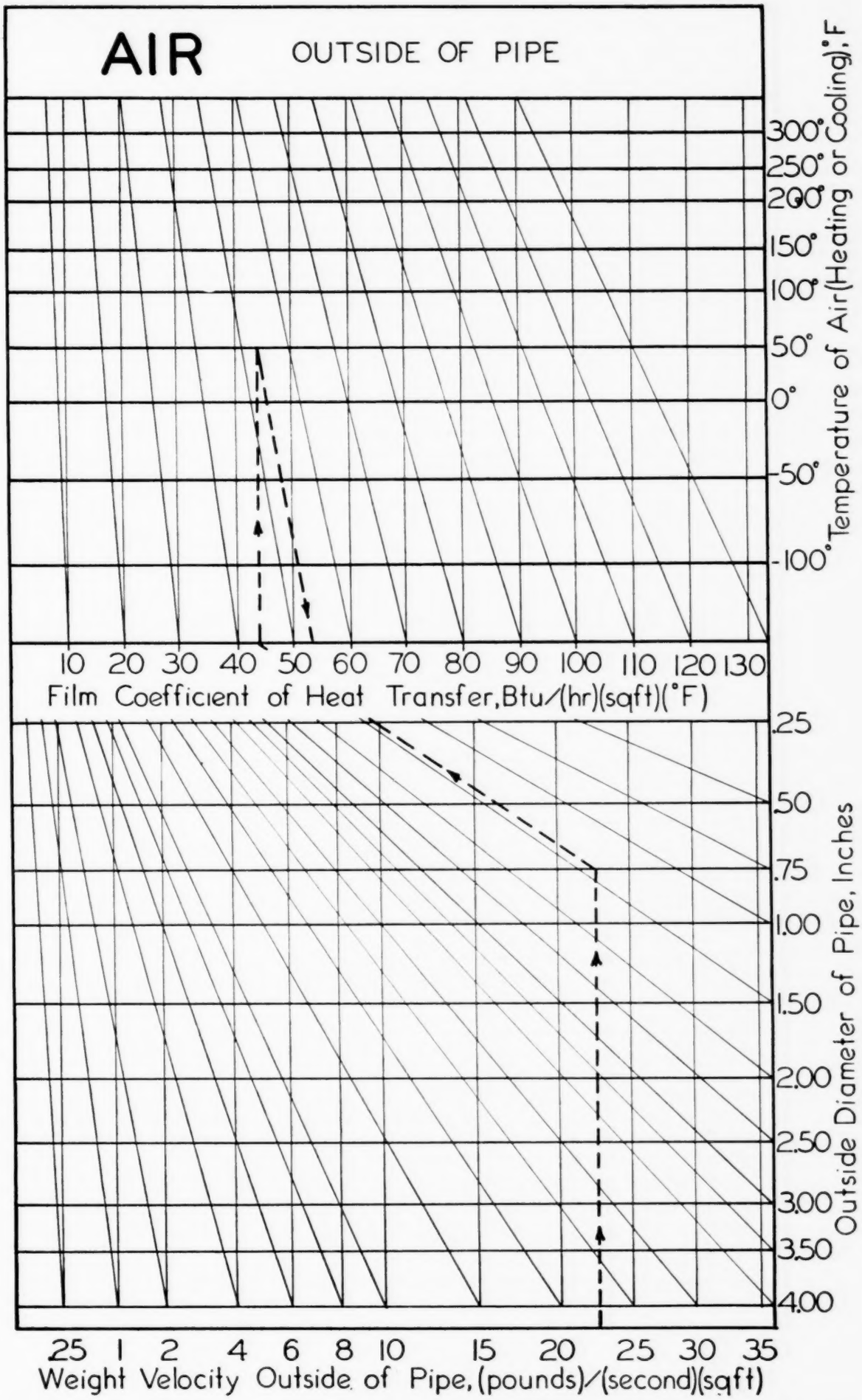

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Fig. 28. Film coefficient for air flowing outside a pipe.

Experience is my Classroom

By T. W. REYNOLDS

DEPARTMENT STORE FIRES

This and that cause many a fire in department stores—the kitchen exhaust ducts, the rubbish chute, and then there are the escalators as another risk. Cigarette butts, dead or otherwise, find their way to the inside of escalators where they are ground up and eventually collect at certain points. A lighted cigarette finally starts a fire which is not always easy to reach.

Access doors to escalator enclosures should be at points where maintenance men can readily enter or debris will not be removed. If they are not, a workman will say he has cleaned everything out when he has not.

A fan blowing air into the enclosure to keep the motors cool will increase a fire and spread its smoke until the fan is finally shut off. Sometimes an exhaust fan is used, but this has the added disadvantage of adding dust to the accumulated debris. A vacuum pipe to the space will not remove the foreign materials, since an exhaust is not directional and a piece of paper may close the inlet to the suction pipe. A carbon dioxide system is the best answer to the problem of extinguishing such fires.

The rubbish or paper chute receives the floor sweepings, paper wrappings and boxes from many floors. By the end of the day the chute may be fil'ed up to two or more of the lower floors while awaiting baling of the paper in the sub-basement. It is thought that matches, particularly the match of the parlor type, or even lighted cigarette butts are swept up. Pressure on matches as they slowly scrape the walls of the chute, as the material accumulates and slowly settles, could start a fire.

Fires in the chutes usually occur about 1 a.m., hence pressure might also cause spontaneous combustion in the late hours. Such fires are difficult to extinguish, but usually burn themselves out without damaging any property and there is no panic set up from smoke since the public is not around when they occur.

Paper which goes to the incinerator should be temporarily collected in an adjacent fireproof rubbish room. This room should have sprinkler protection.

EVALUATING BOILERS

Some engineers still appraise a boiler ability on the basis of its poundage, or even its volume, and some appraise its monetary value as so much per pound of iron. Such methods do not give reasonable approximations. Any prices that might be established for boilers on the basis of volume, rating, or weight will be inaccurate for many boiler sizes because such factors neither govern entirely the cost of boilers nor affect the cost of each boiler to the same extent.

Cost of machining in proportion to weight of boilers, especially in half section boilers, varies in different sizes. A wide boiler of a few sections, may cost more than a narrower boiler of greater number of sections and greater capacity. The narrower boiler may have less weight or competitive conditions which exist only on certain sizes and in certain localities may affect the prices of those sizes to such an extent that selling price bears no definite relation to cost of production.

Factory changes and volume production effect more economical production in certain sizes of boilers from time to time and competitive conditions in the various sizes constantly change. A change in price seldom affects the entire line to the same extent. In any event, boiler prices are subject to wide fluctuations.

COUNTER FLOW VAPOR PRESSURES

One of the things sometimes lost sight of is that vapor pressures can go counter to air flow. To illustrate, suppose you have to condition a space to be used for the making of candy. In order to keep the humidity down, the conditioned air may be 100% from outdoors. This air must be relieved from the space, so what could be better than to relieve it through a register or a relief damper in the wall separating the space from the candy kitchen. It would help to cool the kitchen and provide make-up air for the kitchen exhaust. Its a nice set up, but it will not work, because vapor from the kitchen will go backwards to the candy shop against the air flow through the register and will add humidity to this space.

Within industry it sometimes happens that the occupants of a space are fully as uncomfortable as the occupants of an adjacent space due to a high humidity from the process in the adjacent space diffusing throughout both spaces. The humidity of the process space can be kept down if it is possible to remove the vapors as formed. On the other hand, if the humidity is a condition which must be maintained, there is only one thing that can be done to prevent it from travelling to the adjacent space, and that is the interposition of vapor barriers between the two spaces.

The fact that differences in vapor pressure sends vapor to the region of lowest pressure through most anything is often lost sight of when calculating latent load of a conditioned building of hollow glass block. The outdoor air don't get through the block to the conditioned space, but the outdoor vapor does.

CHECKING PLANS

When the plans are all said to be done, and not till then, check the design for the things most likely to be missed. What about the ceiling? Is there acoustical treatment? Most likely so, probably added as an afterthought. No one told you about it, no one thought you would be interested. You don't want smudges on that ceiling and you don't want the air forced down by the rougher surfaces of an acoustical ceiling. To prevent this condition, the type of outlet (not the make) must be changed to one having an air discharge which does not rub the ceiling, or else a smoothened surface in the form of a plaque of large diameter must be provided around each outlet.

Also check each room on the plans for its rate of air change. If too high, use the right type of outlet for this condition. Are the partitions liable to change as time goes on? If so, use the type of outlet which can be closer to a partition without being seriously affected by it. Next, check the sensible heat percentage of each conditioned space and select that percentage for the apparatus which is a normal average of the most important rooms.

Check the thermostat locations, though it may be just as fruitful of results to check them later on the job, for the installer has his own ideas. In a room with mechanical air supply, the thermostat can no doubt go to any

Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.

of the inside walls and yet be in the air movement, but you don't want three of such thermostats lined up on one wall like a set of radio dials. This occurred on a recent installation and in an office that, unfortunately, had to be the owner's office.

There was one thermostat for the radiators, a second for the electric strip booster heater to this office, and a third for the zone. The owner asked the installer what it was all about; unfortunately the installer told him that he was just as confused himself. So the thermostats got highlighted and the writer had to get busy. He told the installer not to get them all in one office. On the next inspection the zone thermostat was found out in the corridor where there was no sun and therefore no zone.

MISTAKES ARE STEPPING STONES

Speaking only for himself, the writer would rather be engaged in the thrill of action even to the extent of making an occasional embarrassing error, than to be wise but sitting on the sidelines. The first of these things is youth, the second is old age.

One who writes for publication starts out with a fear of saying the wrong thing, presumes that he is expected to be infallible, becomes annoyed by criticism, and defends his errors by every twist he can apply. As time goes on, he changes in attitude for few write in. He wonders who reads what he writes and welcomes what criticism comes along as evidence of a public following.

It was 32 years back that Ira N. Evans published a lot of tables on the economics of recirculating air for schools. The writer, concluding that no one could do such a job of figuring without errors creeping in went laboriously through the calculations and in writing pointed out the errors. Much to his surprise, Mr. Evans complimented his critic and replied, "If more readers would go into these details it would do more than anything else to improve the quality of technical literature." We did not, however, agree in so many words that the errors were not material, nevertheless the tables as corrected and published gave somewhat different conclusions.

CORRECT STATEMENTS

Statement: A radiator of copper and one of cast iron will be equally as hot if each has a good air valve connected to it and all piping and other conditions are equal.

Correction: As air valve is only governed by its close environment and knows neither whether the radiator is hot or free of air. The air is never fully out in any radiator. It takes a perfect vacuum to do that. A copper radiator has a lot of extended surface which is dependent upon its small primary surface for heat and the volume of the radiator is small. A given amount of air will blanket or rather affect more heating surface in such a radiator.

When starting up, the small amount of air already in a copper radiator will be quickly vented, but the air in each connecting riser and runout will also have to be vented through their respective radiators. If this was all the air that had to be vented there would still be quite a bit less of air for the copper radiator to vent. Each radiator, however, continues to vent air from the general piping system until the steam advancing in the main has pushed the air to beyond their respective risers.

Statement: When an oil burner has stopped so that the heating system goes under a vacuum, a radiator of cast iron will feel hotter to the touch than one of copper, because it draws in more of the remaining steam due to the greater condensing effect of its greater weight.

Correction: As long as the two radiators are adjacent and all other conditions are equal, the copper radiator should be hotter to the touch due to its greater conductance. The cast iron radiator due to its weight of metal, retention of condensate within loops, as well as condensate retained on the greater surface of its interior walls, will remain warmer for a longer period of time after there is no longer any circulation of steam under vacuum.

As long as there is sufficient sensible heat in the burner refractories and in the metal and water of the boiler to furnish the latent heat of evaporation under vacuum, the steam will expand to fill the system, going as readily to one radiator as to the other. If the aquastat on the boiler is set for a rather high temperature, the sensible heat extraction from the boiler water may drop the temperature of this water to aquastat setting. This would bring on the burner, so that steam would continue to circulate throughout the system until such time as pressure was required to free the system from air which leaks in more and more as the vacuum increases.

Statement: Metal conducts more heat the denser it is.

Correction: This is generally true due to greater exclusion of non-conducting molecules of air as a metal becomes denser, but some metals are denser than others, yet poorer conductors. Conductance depends a lot upon crystal formation.

Statement: Steam short circuits in a radiator much quicker under partial vacuum than it does when under pressure.

Correction: Theoretically, yes, because there are less molecules to collide with in a vacuum. The only effect of a partial vacuum is that there is less air in the radiator, so that when starting up the heating system, steam quickly fills the radiator, hence at such times there is more condensate in the radiator in a given time.

IT LOOKED WRONG— BUT WORKED

Why is it that due to certain physical and other limitations we sometimes have forebodings as to how well a particular design will work out in actual operation. We have our fingers crossed, as we are wont to say, and would be surprised if it worked at all.

Such was the case with the air conditioning for the Irish Pavilion in the 1939 World's Fair at Flushing, N. Y. The building was in the shape of a clover leaf with plenty of glass block. Eire had but little representation here, so but little could be learned in the time required as to how they would decorate the inside of those clover leaves. So the writer could do nothing but bring up the ducts to the ceiling in the central core of the building and from there blow air the full length of each leaf. In actual operation the system worked much better than any other installations in the Fair. As one engineer remarked to the writer, "Perhaps that was because it had not been designed."

QUESTIONS AND ANSWERS

How should a fixed louver for outdoor air be constructed?

Why not make the drip pan for a cooling coil in a duct a part of the duct?

What should be the minimum distance from fan inlet to adjacent sheet metal casing?

Should the headers for coils in ducts be inside or outside of the duct?

These are all questions that have come up and the answers follow:

Generally accepted practice calls for the louvers to have a pitch of 45°, to be 4 in. wide horizontally and to have ½ in. leading and trailing edge dimensions.

Drip pan should be separate from the duct, so that it can be removed for cleaning or renewal. It should be of heavier gage than the duct, the better to withstand corrosion.

The minimum distance from fan *inlet collar* to casing should be equal to two thirds of the fan inlet diameter. A further reduction will make the fan less efficient. In good design the minimum distance and the fan inlet diameter should be the same.

The coil headers should be outside of the duct where they are accessible and no sheet metal stops are required.

NEWS OF EQUIPMENT AND MATERIALS

Humidifier

NAME—Self-contained humidifying unit.

PURPOSE—Compact unit for humidification purposes.

FEATURES—All essential parts are built into a cabinet 13⅞ x 14¼ in. and 6 in. deep. Parts consist of four humidifying nozzles, water tank with float valve, water strainer, air filter, air regulator with pressure gage, and solenoid-operated valve. Humidistat is separate from the cabinet and installation of both the humidistat and the cabinet can be made wherever desired. As supplied, the unit is ready for connection to air line, water line, and electrical circuit. Nozzles are individually adjustable for position in the cabinet so that the direction of the sprays may be set as required.

SIZES AND CAPACITIES—Four nozzles to atomize 35 lb of water per hour using 5 cfm of atomizing air supplied at 32 lb per sq in.

MADE BY—*Spraying Systems Company, 4021 West Lake Street, Chicago 24, Ill.* **107**

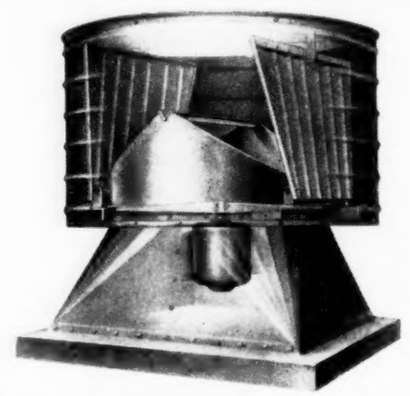
Foundry Ventilators

NAME—Robertson foundry ventilators.

PURPOSE — For the removal of smoke, heat and dust-laden air in foundries.

FEATURES — Ventilators are provided with a one-piece, cast aluminum fan. These fans are statically and dynamically balanced to insure vibration-free performance. For corrosive conditions, fans can be protected with special coatings or an acid-resisting bronze can be used. Where heat conditions make it necessary, ventilators can be equipped with a breather duct through which a current of outside air is passed over the motor. This cooling effect, it is claimed, permits the use of a standard motor and minimizes the possibility of corrosive fumes coming in direct contact with the motor. Portions of the duct are removable for easy access to the motor.

SIZES AND CAPACITIES — Air discharge of 4500 to 84,800 cfm.



LITERATURE AVAILABLE—Illustrated folder.

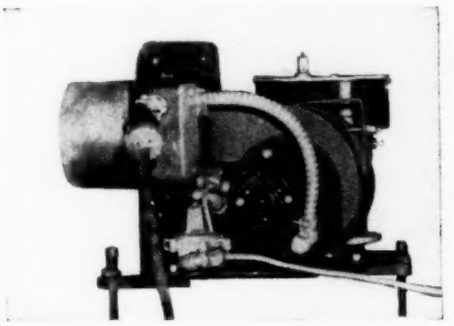
MADE BY—*H. H. Robertson Co., Farmers Bank Building, Pittsburgh, Pa.* **108**

Oil Burner

NAME—Jetronic home oil burner.

PURPOSE—Space heating for the home.

FEATURES — Burner will use any type oil. A calibrated control permits an hourly consumption setting of from ½ to 1½ gal. Burning at a tip temperature of 2300F, makers claim that all carbon, sulphur, and ferrous oxides are consumed and a clear, smokeless flame is produced. Oil flows into the firing head assembly made of 11 gage stainless steel where it is heated at 1000 to 1600F and is mixed with air over a baffle. This gaseous mixture is forced through a series of jets into the combustion



chamber. Only two electrical connections—thermostat and limit—are required. This burner, which is adaptable to all types of warm air furnaces and steam and water boilers, is said to show high efficiency.

MADE BY—*Consolidated Industries, Inc., Lafayette, Ind.* **109**

Level Alarm

NAME—Levalarm.

PURPOSE—Device to provide warning signal when predetermined level is reached in small boilers or tanks.

FEATURES—Device can be used on pressures up to 250 lb. An electric switch is operated through the

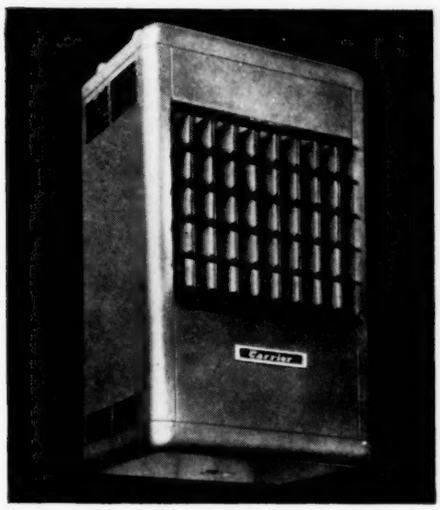
agency of a permanent magnet when a Monel float rises or falls in a separate float chamber. Switch can be wired for a normally open or normally closed circuit.

MADE BY—*The Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland, Ohio.* **110**

Unit Heater

NAME—Carrier gas-fired unit heater model 46T.

PURPOSE—Space heating through combustion of gas.



FEATURES—Units will operate on either manufactured, natural, or mixed gas. Heat interchanger and combustion chamber assembly are made of heavy gage steel, electric welded, to provide one-piece leakproof construction. Air for combustion purposes and for the draft diverter intake is drawn in from the sides of the unit. Motors, fans, and controls are standard products of recognized manufacturers and can be easily serviced or replaced. Burners are of heavy wall cast iron and are interchangeable for various gas mixtures. Units are equipped with automatic gas shut off. High temperature safety control prevents excessive metal temperatures and overheating. Adjustable louvers permit warm air to be directed to selected areas.

SIZES AND CAPACITIES — Six sizes from inputs of 65,000 to 200,000 Btu per hr.

MADE BY — *Carrier Corp., Syracuse, N. Y.* **111**

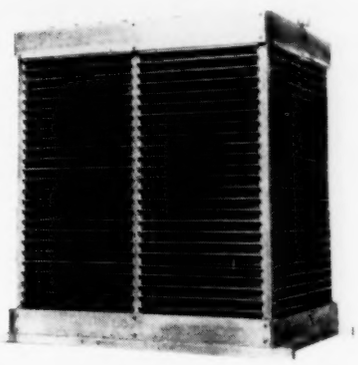
Cooling Tower

NAME—Marley series 100 cooling tower.

PURPOSE—To supply the need for a small natural draft cooling tower.

FEATURES — Tower is fabricated from California heart redwood and all hardware is galvanized. Louvers are slip-fit, and are removable for inspection or access to the interior of the tower. Spray system was designed to give maximum breakup at lowest pressure and to provide a balanced spray in all areas in the tower. Marley bronze spray nozzles are used. Towers are prefabricated and shipped knocked down with each member piece marked.

SIZES AND CAPACITIES—Frames for 4 to 36 tons of refrigeration depending on local wet bulb conditions.



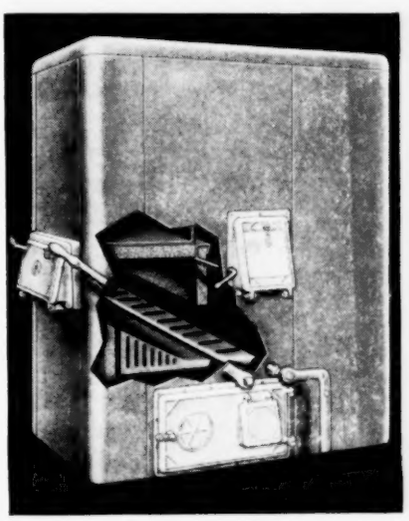
MADE BY — *The Marley Co., Inc., Kansas City 15, Kans.* **112**

Smokeless Stove

NAME — Worsham minute smokeless furnace.

PURPOSE — Smokeless burning of coal for house heating.

FEATURES—Burning pace is controlled through draft dampers automatically operated by an upstairs thermostat. Manual movement of one furnace lever dumps ashes into an ash container and the movement of another lever transfers the remaining incandescent coke. Coal is then poured into the furnace and no shaking of grates is necessary. Makers claim a combination cross feed down draft and bank firing method is worked into a single integrated mechanical operation.



MADE BY—*Worsham Company, Inc., 7329 Lohmeyer Avenue, St. Louis, 17, Mo.* **113**

Leak Detector

NAME—G-E portable leak detector.

PURPOSE—For testing hermetically sealed units used in refrigerators and air conditioners in which halogen compound is the refrigerant.

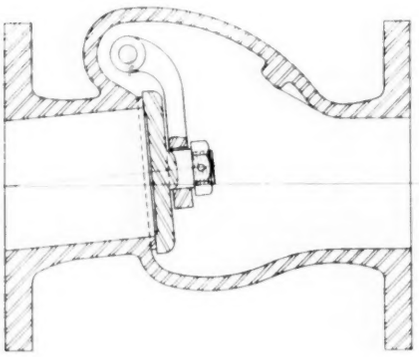
FEATURES—Makers claim that instrument is so sensitive it can detect a leak that will only release

.01 oz of Freon in one year. Detector is a hand-held probe with a metal nozzle and a plastic tip. Unit contains an element responsive to halogens in the air, and a motor-driven blower to circulate the air through the sensitive element. Unit contains a power supply, amplifier, indicating instrument, necessary controls and a carrying strap. A 25-ft lead is supplied for connecting the unit to a source of power. It operates on any commercial 115-volt, 60-cycle power supply.

MADE BY—*General Electric Co., Schenectady 5, N. Y.* **114**

Swing Check Valve

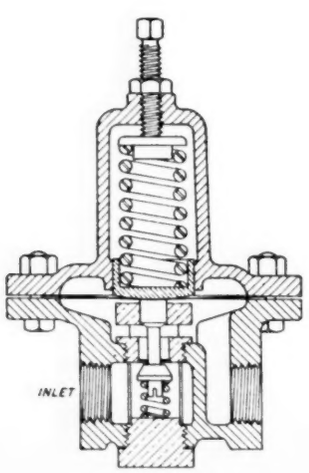
NAME—Cooper swing check valve.
PURPOSE—For flow service that requires a stainless steel valve of the swing check type.



FEATURES—Body is made in one piece and is entirely void of gaskets. Disc arms and pins are free to rotate independently of each other. This is said to reduce the chances for either member freezing. Hinge pin can be removed from either side of body by removing one plug only. Valve can be furnished with outside levers and weights for manual or automatic control. Made in various stainless steel alloys.
SIZES AND CAPACITIES—½ to 3 in. for 300 lb service; ½ to 6 in. for 150 lb service.
MADE BY—*The Cooper Alloy Foundry Co., Hillside, N. J.* **115**

Pressure Reducing Valve

NAME—Muessco type 31 pressure reducing valve.
PURPOSE—Pressure reducing valve for use with steam, air, non-corrosive gas, and liquids, with initial pressure up to 250 lb per sq in. and temperatures not exceeding 450F.



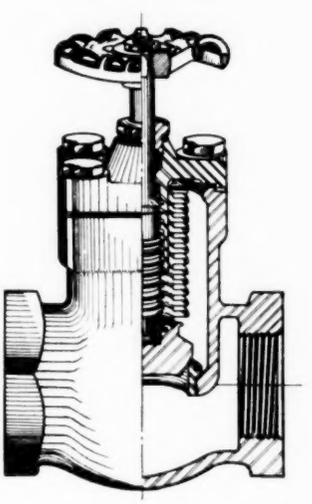
FEATURES — Valve is designed to receive a varying or high pressure and to deliver a constant reduced pressure under varying loads. Valve is made expressly for installations such as unit heaters, spraying equipment, sterilizers and so on. Valve has an extra heavy semi-steel or bronze body with a renewable inner valve unit of naval bronze or stainless steel. It also has a stainless steel inner valve spring, and a phosphor bronze or stainless steel diaphragm which is laminated according to the pressure and service for which the valve will be used.
MADE BY—*Mueller Steam Specialty Co., 40-20 22nd St., Long Island City 1, N. Y.* **116**

Control System

NAME—Dual-Range.
PURPOSE—Control to make a furnace provide rapid response to changes resulting from outside air temperature fluctuations.
FEATURES—Control is designed for gas conditioners and for coal furnaces for forced air operating with conversion burners. By maintaining a constant low velocity air flow into the rooms, the rate of heat release to the rooms can be varied by changing the air temperature rather than by altering the amount of air admitted. The original single gas valve cycles full on and full off as formerly, but in accordance with a dual operating cycle depending upon weather conditions. Dual thermostat and temperature limit controls are used. One set of controls is set for about a 50F rise (120F outlet temperature), and the other for a 100F rise (170-180 outlet temperature). Upon a drop in room temperature the first stage of the thermostat establishes a circuit through the limit control which is set at 120F. As long as the room temperature does not further decrease, the gas valve cycles on the 120F limit control. If the room temperature rises 0.75 to 1F, the first stage circuit is broken and the gas valve closes. The thermostat has a heat anticipating element in the second-stage circuit which is said to make the instrument supersensitive when the second stage is in operation. The complete system is being marketed as a packaged unit.
MADE BY—*Janitrol Division, Surface Combustion Corp., Toledo, Ohio.* **117**

Packless Valve

NAME—No. 3000 series packless valve.
PURPOSE—Packless valve designed to eliminate stuffing boxes and



other means for preventing leakage.
FEATURES—A seamless metal bellows forms a leakless connection between the valve disc and the valve body. Makers claim that no maintenance is required to keep the stem tight against leakage. Bellow is available in either steel or Monel metal. For high vacuum service and for other service that may require it, a composition disc is available in place of the metal disc.
SIZES AND CAPACITIES — In sizes from ¼ to 3 in. with screwed, welded or flanged ends and for temperatures up to 300F. For temperatures higher, a yoke and external thread construction is used.
MADE BY—*Dept. P-V, Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville, Tenn.* **118**

Tachometer

NAME—Metron precision tachometer.

PURPOSE—Instrument for obtaining rotating speeds to extreme accuracy.

FEATURES—Instrument employs an electric bridge circuit and is self-calibrating. When calibrating, the sensitive speed measuring circuit is matched against internal precision resistors, thus insuring readings against changing ambient conditions. Tachometer head employs only one rotating part which is permanently lubricated for a long life.

SIZES AND CAPACITIES—Type 48H, for speeds of 900 to 10,000 rpm; type 48J, for speeds of 90 to 1000 rpm.

MADE BY—*Metron Instrument Company, 432 Lincoln Street, Denver 9, Colo.* **119**

Attic Fan

NAME—Chelsea type EV attic fan.

PURPOSE—For ventilating stores or homes.

FEATURES—Unit is sold as a package and consists of vertical discharge fan and motor, automatic ceiling shutter, floor mounting brackets and springs, canvas boot for seal between fan and attic floor, and pull chain switch with fuse link. Fan was designed for installation between ceiling and roof.

SIZES AND CAPACITIES—30-in. fan delivers 6,000 cfm; 36-in. fan delivers 8,500 cfm; and 42-in. fan delivers 12,000 cfm.

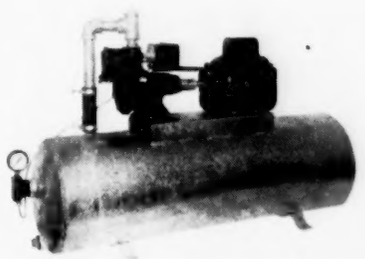
MADE BY—*Chelsea Fan & Blower Co., Inc., 1206 Grove St., Irvington 11, N. J.* **120**

Shallow Well System

NAME—Roth Masterflo shallow well system.

PURPOSE — Complete storage and pumping system for drawing water from shallow wells.

FEATURES — Turbine pump has a cast iron body, bronze head, impeller and liner, and stainless steel shaft ball bearings. Motor is single phase, 110 to 220-volt operating at 1,750 rpm. Pressure switch starts at 20 lb and stops at 40 lb pressure. A check valve and strainer protects the pump from foreign particles and holds the prime. Unit comes complete with the necessary controls and gages.



SIZES AND CAPACITIES — S-340 delivers 320 gph against 30 lb pressure with a ¼ hp motor. The S-420 pumps 420 gph with a 1/3 hp motor.

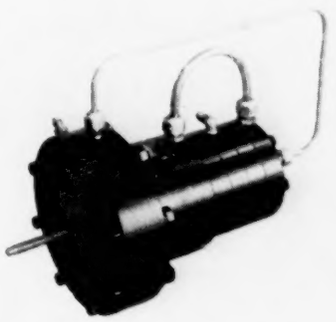
MADE BY—*Roy E. Roth Co., Rock Island, Ill.* **121**

Positioning Device

NAME—Micropositioner.

PURPOSE—Power unit for positioning a lever within a very accurate range.

FEATURES—Instrument employs a pneumatic pressure of 60 lb per sq in. and can position a lever within a few thousandths of an inch over a range of 0 to 0.5 in. and works directly without any mechanical linkage. Makers claim that unit can be applied for positioning of oil burner tips, governor gear on boiler feed pumps, and other devices requiring precise positioning.



MADE BY—*Hagan Corporation, Pittsburgh, Pa.* **122**

Fractional Motor

NAME—Type CSI fractional horsepower motor.

PURPOSE—Small size motor having high torque starting characteristics.

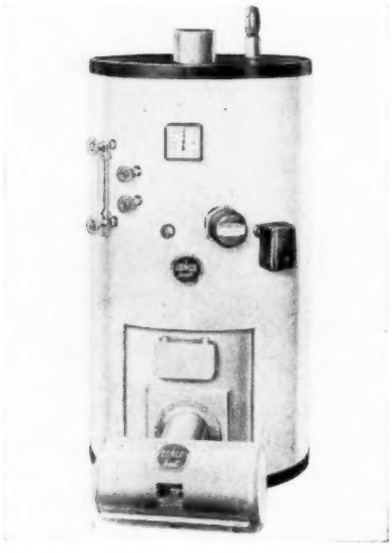
FEATURES—Rotor is of all welded, pure copper bar construction which, according to the manufacturer, provides for a low starting current combined with high starting torque. Motor is of splash proof design, has a steel frame and die cast aluminum alloy and bells with cast-in terminal for easy wiring. Either solid or resilient bases are provided, slotted for easy belt adjustment. Motors are said to be adaptable for stokers, pumps and compressors, and where high starting torque, heavy loads, and long service are required.

SIZES AND CAPACITIES—Frame ratings of 1/6, ¼, 1/3, and ½ hp, single phase, 60 cycle, 115 to 230 volt.

MADE BY—*Torq Electric Manufacturing Corp., 1007 Interstate St., Bedford, Ohio.* **123**

Boiler

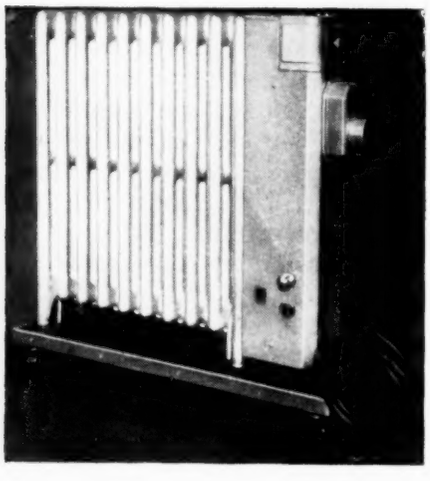
NAME—Conco boiler-burner unit.
PURPOSE—Space heating.
FEATURES — Boilers, which are available in square or round-jacket-



ed types, are provided with a built-in tankless heater for domestic hot water. Patented heat transfer surface consists of six horizontal flues having a temperature of intake of 1200F and a stack temperature of less than 500F. Units are fabricated of Yoloy, a special corrosion - resistant alloy nickel steel and are fired by the Conco burner.
MADE BY—*Conco Engineering Works, Mendota, Ill.* 124

Electric Radiator

NAME—Roller-radiator.
PURPOSE — Portable electrically operated radiator for space heating.



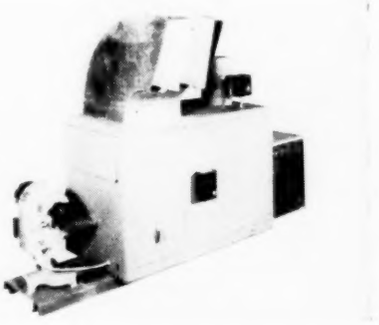
FEATURES — Unit is provided with Mercoid automatic thermostat and pressure controls. The 10-section 4 column cast iron radiator, produces 4,750 Btu per hr. Thermostat automatically turns power on or off as desired temperature is reached. A gage indicates when additional water is needed. Unit generally uses about a quart of water every 3 months. Radiator has 18.7 sq ft of radiation and is mounted on casters so that it can be moved readily.
MADE BY—*Terminal Hardware, 411 Linden Ave., Wilmette, Ill.* 125

Smoke Indicator

NAME—McNeill model ES I-2 electronic smoke indicator.
PURPOSE—For the detection of smoke through an electronic instrument.
FEATURES—Density meter is calibrated in Ringelman, 0 to 5. Relays are adjustable to energize alarms at any pre-determined density of smoke. Warning bell can be mounted at a point distant from the instrument. A green signal light indicates unit is in operation and a red light is a visual indication of smoke violation. Unit can be provided with a solenoid to operate steam jets and blower fans when smoky conditions occur in boiler.
MADE BY — *McNeill Engineering Co., Chicago, Ill.* 126

Automatic Oil Furnace

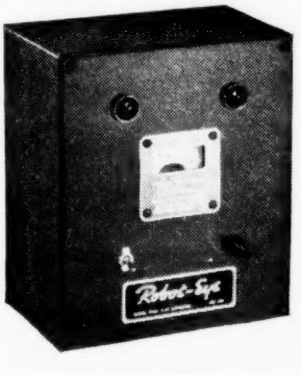
NAME—Sermat portable automatic oil furnace.
PURPOSE—Oil-burning furnace designed for operation in commercial buildings.
FEATURES—Unit has an Underwriters' Laboratories approved jet-type gun burner, the nozzle of which delivers 120,000 Btu per hr at the bonnet. It has a fresh air delivery of 2,800 cfm and burns No. 3 grade oil or lighter. Furnace has a Minneapolis-Honeywell combination fan and limit control, an automatic stack control, automatic humidifier, and a filtered air intake. It is equipped with steel skids so that entire unit can be moved from building to building or it can be mounted on a low truck. Its design permits use as a space heater with the plenum



mounted on top of the furnace, or it can be connected to ductwork.
MADE BY—*Service Metal Fabricators, Inc., 2350 W. 58th St., Chicago 36, Ill.* 127

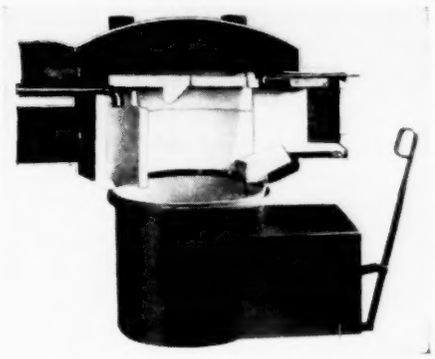
Combustion Control

NAME—Robot-Eye.
PURPOSE—Photoelectric control to regulate combustion efficiency.
FEATURES—Unit is designed to observe the blue gas of oil burning installations using No. 5 or No. 6 oil. It automatically adjusts the air supply when necessary. Equipment consists of an electronic eye, a control panel which also indicates combustion conditions at all times, and a secondary air door motor controlled by instruments in the panel. While the control is applicable to horizontal cup burners, it may also be used with steam or pressure atomizing burners using No. 5 or No. 6 oil.
LITERATURE AVAILABLE — Bulletin No. 10.
MADE BY—*General Power Plant Corp., 381 Fourth Ave., New York 16, N. Y.* 128



Warm Air Furnace

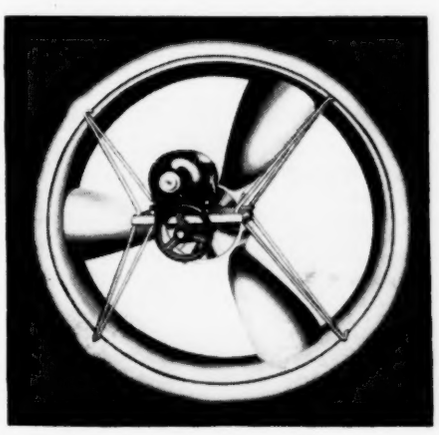
NAME—Smokabator.
PURPOSE — Smokeless operation of coal-burning furnace.
FEATURES—Unit works on a down-



draft principle which is said to be just reverse of conventional furnaces. Primary air enters through the feed or firing door and is drawn down through the hot bed of coal or coke. In traveling through the fire bed the carbon particles of the smoke and the gases carried by the air are consumed. Unit has an over-sized refractory magazine.
SIZES AND CAPACITIES — Several sizes available for use in low-basement homes, large houses, or small industrial plants.
MADE BY — *Wheeling Furnace Corp., Martins Ferry, Ohio.* **129**

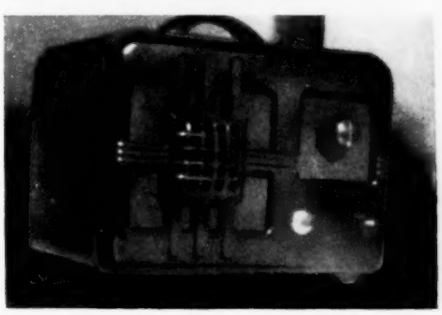
Fan

NAME—Lo-Noise fan.
PURPOSE—Quiet operating exhaust fan for general ventilation.
FEATURES — Fan is delivered complete with motor, belt, blades and curved orifice ring, ready for installation. Fan blades are of a very wide design. These are powered by a total enclosed motor.
SIZES AND CAPACITIES—Sizes from 28 to 48 in., delivering from 6000 to 30,000 cfm.
LITERATURE AVAILABLE — Bulletin 2001.
MADE BY—*Hartzell Propeller Fan Co., Division of Castle Hills Corp., Piqua, Ohio.* **130**



Ozonator

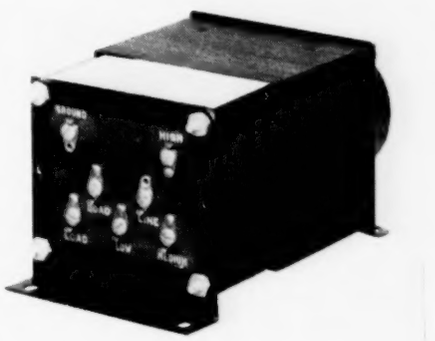
NAME—Ozo-Ray.
PURPOSE — Generation of ozone to serve as a deodorant and purifier.
FEATURES—This small portable unit has a generating element which consists of a bank of plastic plates with an electrode imbedded in each plate. A high voltage is imposed on the plates, ultra violet rays are set up between the plates, and ozone is generated. A current of air from a small motor-driven fan forced the ozone into the surrounding air. Unit is enclosed in a Bakelite case.



SIZES AND CAPACITIES—Unit measures 6½ x 6½ x 9 in.
MADE BY — *Ozo-Ray, Inc., 230 E. Ohio St., Chicago, Ill.* **131**

Transformer

NAME—G-E autotransformer.
PURPOSE—Designed to adapt standard 115-volt, 60-cycle hermetic refrigerator motors for use in 50-



cycle and other voltage applications.
FEATURES—Line of autotransformers was designed to meet the varied requirements of the refrigerator export market. The company found that two standard .550-kva units, differing only in voltage ratios and taps, are adequate to meet requirements of virtually all of the commercial refrigerator markets.
MADE BY — *General Electric Co., Schenectady 5, N. Y.* **132**

APRIL, 1948

TO OBTAIN FURTHER INFORMATION ON NEW EQUIPMENT

On the list below, circle the item number of the equipment in which you are interested, using the number found at the end of each item.

107	108	109	110	111	112	113	114	115
116	117	118	119	120	121	122	123	124
125	126	127	128	129	130	131	132	

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NEWS OF THE MONTH

CONSTRUCTION ACTIVITY

shows trend to South and West in detailed Commerce Department study.

A major undertaking of the Construction Division, Office of Domestic Commerce, U. S. Department of Commerce, is the long term study of the relationships between the volume of construction and the general levels of output, employment and income in the economy. Construction markets, however, are peculiarly local in character. A recent report on *The Geographic Distribution of Construction Activity in the United States* covering the war years and reconversion to peacetime practices is considered a vital section of the larger project of which it is a part.

Significant shifts in construction activity are revealed in this analysis. The overshadowing of certain of the northeastern regions by areas in the South and West with respect to rate of development is but one indication of the geographic reorientation which must be reckoned with by economists, market analysts, and businessmen.

• **GO SOUTHWEST.**—In the years surveyed, construction activity has been moving westward and southward. These areas are displacing the New England and Middle Atlantic regions as the foci of construction growth, due primarily to the development of manufacturing and commercial enterprise in newer urban centers. The greatest effect on construction during this period has occurred through the location of new manufacturing facilities and the expansion of existing facilities in response to the need of production for war. Migration which took place to supply additional workers for the war inflated productive mechanism, a greater number of income recipients resulting from increased employment, and the provision of housing to hold new workers on the job represent the key steps in the procedure by which the pattern of new construction was influenced and altered.

Some States and groups of States gained in relative importance during the war period and have maintained or exceeded their prewar relative position in the postwar period; others made gains in the war interval and relapsed to their prewar standing upon termination of wartime building controls; and some States lost in relative importance in the period of the warbuilding boom but have regained and even exceeded their 1939 standing in the 1946-47 totals, as indicated in Table 1.

• **EXPANSION OF FACILITIES.**—About $76 billion was spent for new facilities, for industrial and nonindus-

Table 1 — Population, Income, and Construction Activity Trends, 1939–1947

Region	Estimated Population[1]			Income Payments to Individuals,[2] Dollars			Total New Construction Activity, Dollars			
	1939	1943	1946	1939	1943	1946	1939	1943	1946	1947
U. S. Total, millions.	130.9	134.0	138.4	70,601	140,021	169,373	6,062	7,734	9,890	12,825
	Percent of U. S. Total									
New England	6.4	6.2	6.5	8.12	7.31	7.08	5.9	4.2	5.0	4.9
Middle Atlantic	21.1	19.9	20.2	28.30	23.76	24.50	20.1	13.6	15.5	15.7
East No. Central.....	20.2	19.6	20.5	22.23	22.34	22.09	19.0	17.1	21.2	19.2
West No. Central.....	10.3	9.4	9.5	8.56	8.40	8.99	8.4	8.4	8.0	8.7
South Atlantic	13.4	14.5	13.5	10.06	11.07	11.02	13.7	15.9	13.3	13.5
East So. Central.....	8.1	8.1	7.7	3.98	4.66	4.07	5.6	6.3	5.1	5.2
West So. Central....	10.0	10.2	9.7	6.60	7.44	7.02	8.8	13.3	10.2	10.9
Mountain	3.2	3.4	3.0	2.74	3.04	2.96	4.9	6.8	3.8	4.1
Pacific	7.3	8.7	9.4	9.41	11.98	11.64	13.6	14.4	17.7	17.8

[1]Estimates exclude members of armed forces overseas. They are based on data from the 1930 and 1940 Federal census, state censuses, school statistics, vital statistics, registrations for war ration books, immigration statistics and data on the armed forces.

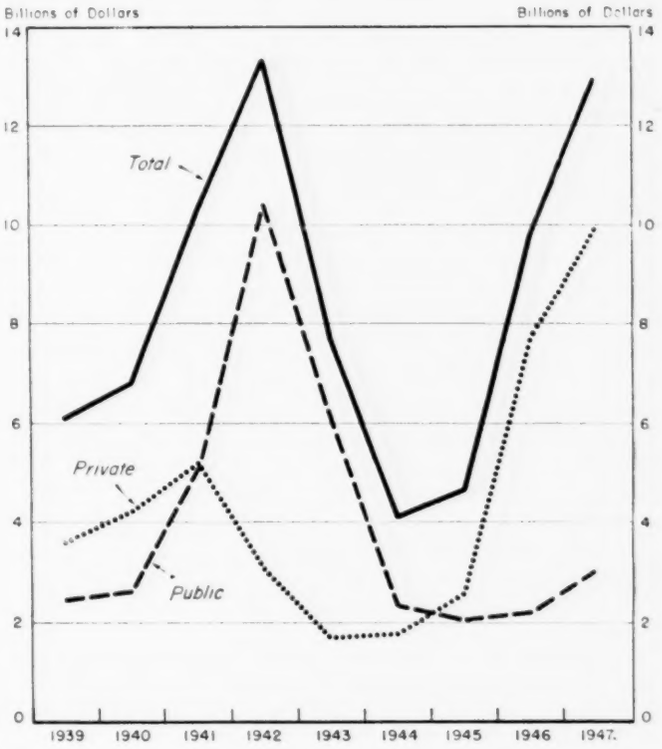
[2]"Income payments to Individuals" is a measure of the income received by residents of each state from business establishments and governmental agencies. It comprises income received by individuals in the form of (1) wages and salaries, after deduction of employees' contributions to social security, railroad retirement, railroad unemployment insurance and government retirement programs; (2) proprietors' incomes, representing the net income of unincorporated establishments, including farms, before owners' withdrawals; (3) property income, consisting of dividends, interest, and net rents and royalties; and (4) "other" income, which includes public assistance, and other direct relief; labor income items such as work relief, government retirement payments, veterans' pensions and benefits, workmen's compensation and social insurance benefits; mustering-out payments to discharged servicemen; family-allowance payments and voluntary allotments of pay to dependents of military personnel; enlisted men's cash terminal leave payments; and state government bonuses to veterans of World War II. Income payments are distributed among the states on a where-received basis (with some exception as to wages and salaries). Only payments made to residents are included in the estimates for the continental United States and the individual states.

trial services, and for mining and agriculture between July 1940 and June 1945. Forty-two billion dollars of this amount was spent for manufacturing facilities, housing and military installations alone. All regions of the country made large gains through location of military installations worth $14 billion within their borders. The South Atlantic States and the Pacific States both had over $2 billion worth of expansion due solely to this type of building. Climate and the availability of acreage in large tracts placed these regions among the leading training areas for all branches of the armed forces.

The effect of facilities expansions is credited as the largest factor in shifting the importance of the nine geographic areas of the country in construction volume between 1939 and 1946. In 1939, the two leading groups, the Middle Atlantic States and the East North Central States together accounted for almost 40% of construction volume in that year while the Pacific States were third in national importance with 14% of the Nation's total. By 1942 the East North Central States were in the lead, followed by the South Atlantic group. The Middle Atlantic States then occupied third place, the West South Central States fourth place and the Pacific States fifth place. Maintenance of construction in the Pacific States at a high rate on essential projects while all other regions were restrained by limitations on construction, placed this group in first place in 1944. By the end of the first postwar year, 1946, the economic potential of some States succeeded in reasserting a pattern of construction which more closely resembled the familiar prewar distribution. However, the East North Central States had replaced the Pacific States as the leader in construction, and the Middle Atlantic States, which in 1939 had been in first place, were reduced to occupying third place. The Pacific States gained second place although these States, paced by California, occupied first place in homebuilding. Almost as significant as the rise of the Pacific proup is the advance of the South Atlantic states to fourth position. Considering the extent of population, income, and employment changes, the increase in construction activity marks this region as one with the very large potentials for growth in business activity and represents the shift from dependence upon agricultural pursuits which has previously marked the development of this area.

Table 2 — Relative Construction Activity of Six Leading States

State	Rank by volume of construction activity			
	1939	1943	1946	1947
New York	1	5	2	3
Pennsylvania	3	3	6	4
Ohio	5	4	4	6
Illinois	4	6	5	5
Texas	6	2	3	2
California	2	1	1	1



New construction, 1939 to 1947.

• **POPULATION, EMPLOYMENT AND INCOME.**—Additional factors associated with changes in relative construction volume among the States are population shifts, employment, income payments, construction costs, and public policy. Each of these factors helps to determine construction volume in a State or region and each is in turn reacted upon by the volume of construction. A significant change in the rate of population increase causes an accelerated change in the volume of construction as facilities for housing, working and recreation are constructed to provide for the increase in population. Thus, the indirect effects of greater urbanization are believed to play a greater part in stimulating construction in a given region than a rise in nonagricultural employment itself.

Conversely, the older industrial areas in which the rate of expansion is relatively slow, fail to add new workers rapidly and need less in the way of additional living space and facilities. Their relative position in new construction activity, therefore tends to be reduced.

• **RESIDENTIAL BUILDING.**—Measurement of construction volume in terms of current dollars tends to give undue weight to activity in years when relative increases in costs or higher prices really deflate the nominal activity which is carried on. The discussion on residential building avoids this difficulty by dealing with the estimates of the number of dwelling units provided, a more realistic measure of housing progress than expenditures for housing.

It is noted that there is a high correlation between the location of residential units built during the war years and the extent of industrial mobilization char-

acteristic of various regions, principally because the 'nonessential' tag did not affect areas engaged in war production too seriously. Between 1940 and 1945, about 2.7 million non-farm dwelling units were put under construction and completed. In 1946 and 1947 combined, it is estimated that nearly 1.3 million permanent dwelling units will have been completed in the United States.

Outstanding in the list of States which have contributed to this high level of performance are California and Texas. Equally noteworthy because of its recovery from a midwar depression in housebuilding is activity in New York State. After building only 900 units in 1944, New York constructed 62,000 in 1946.

• **STATES.**—Construction activity by state is shown in detail in the Commerce Department report as are the trends in population, income, non-farm employment, etc. Relative construction activity of six leading states is shown in Table 2. The report indicates that depression of New York to fifth place in 1943 was caused by restriction of housing construction and use of standing facilities in that state, while in the newer and more open regions of the west, essential housing and new facilities stimulated construction activity.

PASSENGER COMFORT

and higher traction loads for engines to be assured by railroad car with complete A-C weather factory.

A new railroad passenger car carrying its own complete alternating-current-operated "weather factory"—entirely independent of the locomotive for its power—soon will be tested on a major railroad, according to H. H. Hanft, transportation engineer of the Westinghouse Electric Corp.

Speaking at the annual winter meeting of the American Institute of Electrical Engineers at the William Penn Hotel, Pittsburgh, Mr. Hanft said the car would be subjected to varying climatic conditions of summer, winter, mountain, desert and northern plain operations, and later would be placed in revenue operations.

"When used on a large scale," the engineer predicted, "cars like it can result in greater passenger comfort and convenience, improved service reliability for railroads, and greater train speed and loads."

• **POWER PLANT.**—The recently-developed unit, built by the Sturtevant Division of Westinghouse at Hyde Park, Mass., contains its own a-c power plant and the necessary air conditioning and heating equipment to provide air that will be cooled and dried in summer, heated in winter, and electrostatically cleansed of dust and smoke all year 'round. Passengers will drink electrically-cooled water and will read by flicker-free fluorescent lights.

Power to operate all this apparatus is supplied by a 30-kilovolt-ampere Diesel-driven alternating current generator installed under the car, Mr. Hanft said. Such a self-contained powerplant permits locomotive power normally diverted to operate car comfort equipment to be applied entirely to its fundamental job of traction.

To illustrate the serious power drain imposed on locomotives today, Mr. Hanft pointed out that a conventional 14-car train, with electrically-operated diners, that draws power from the "Iron Horse" consumes about 650 hp, or approximately one-fifth of the locomotive's output.

Use of an a-c air conditioning system also permits reducing weight of the railroad car by three to five tons, or five to eight per cent. Most passenger cars now on order will carry d-c electro-mechanical air cooling systems, the engineer said. Such cars require huge storage batteries, weighing 4800 to 9500 lbs, to operate the equipment when trains are at a standstill and the locomotives are not furnishing power.

• **LIGHTER BATTERY.**—In the a-c unit, a battery weighing only 700 lb is needed, for emergency lighting and for cranking the engine. An additional weight saving of 1800 lb comes from using lighter weight cable and conduit in the a-c car.

Heart of the thermostat-controlled air conditioning installation—which has the same refrigerating effect as the melting of eight to nine tons of ice in the car every 24 hours—are the twin five-horsepower hermetically-sealed compressors carried under the car. Other principal components are the condenser, also mounted under the car, thermostats and the overhead-mounted evaporator "package" consisting of blowers, evaporator and electric strip heaters.

The equipment combines to furnish 2400 cu ft of conditioned air every minute, with two-thirds of this supply recirculated from the car itself and one-third being "make-up" air from outside the car.

On cool humid days, below 60F, excessive moisture in the air is reduced to a comfortable level by action of the car heating system. When outdoor temperature climbs above 60F, the first compressor is started automatically and excess water vapor in the car air stream condenses as it comes in contact with the cold evaporator surface, and thus is removed from the car.

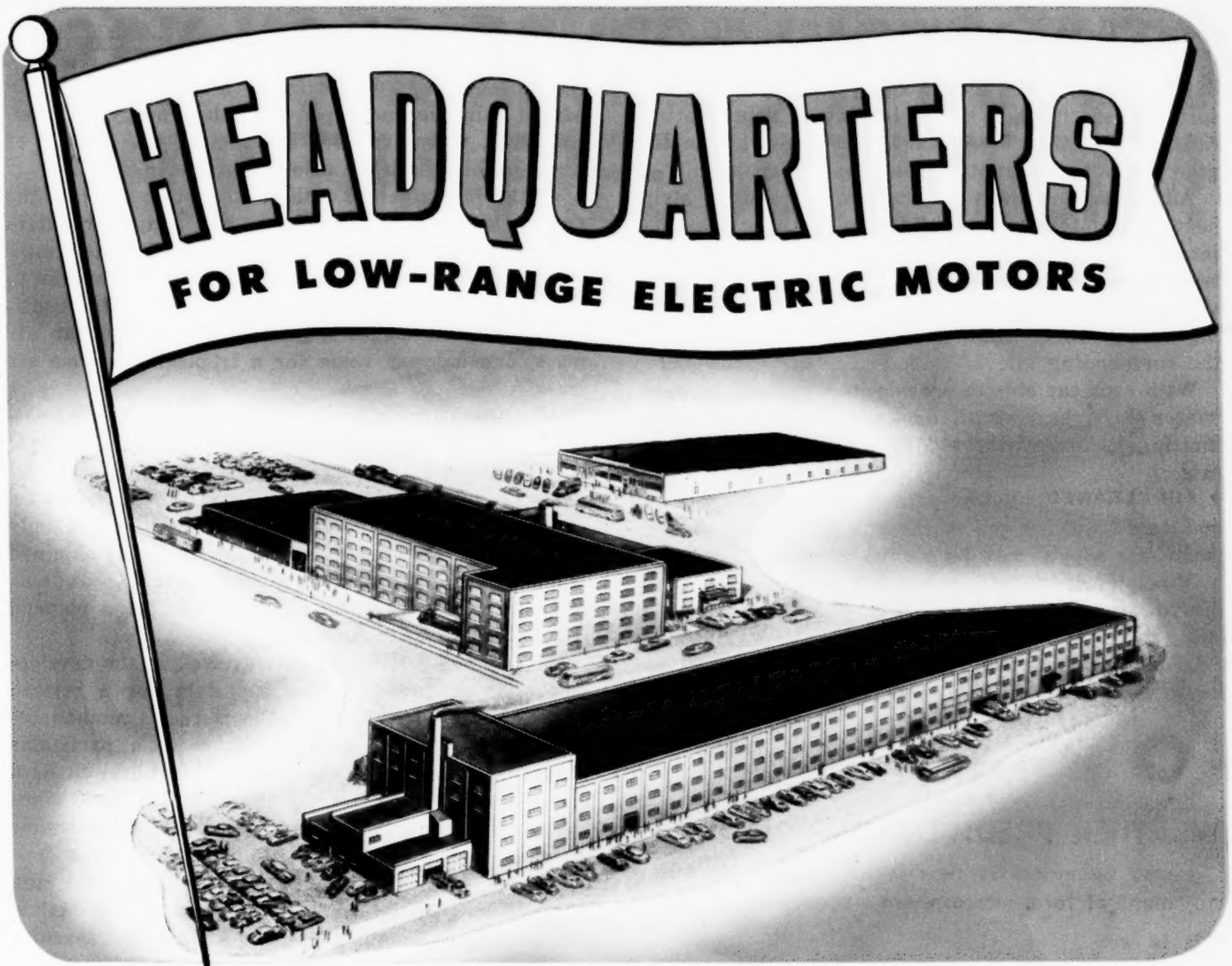
• **HIGH HUMIDITY.**—On days when the humidity is unusually high and it, rather than the heat, is chiefly responsible for discomfort to passengers, the air must be dropped to a low temperature in order to remove enough of the annoying moisture. It is then reheated back to a comfortable level.

When temperature inside the car rises above 75F the second compressor goes into operation and operates as long as is necessary to maintain car air at a comfortable 75F level. Dehumidification occurs continuously as long as either compressor is in operation.

• **HEATING.**—For heating purposes, the car may be equipped with two independent heat sources, relying on steam from the locomotive only in emergencies. Chief source of heat will be 36 gallons of "double

HEADQUARTERS

FOR LOW-RANGE ELECTRIC MOTORS



A.C. MICROMOTORS
4-pole shaded pole up to 1/15th hp.
6-pole shaded pole up to 1/15th hp.

D.C. MICROMOTORS
Continuous duty up to 1/20th hp.
Intermittent duty up to 1/10th hp.

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PACIFIC COAST SALES: Redmond Company of Calif., Inc., 1248 S. Boyle Ave., Los Angeles 23, Calif.

duty" coolant, which after cooling the engine and absorbing heat in the process is sent to floor heating coils. Afterwards, the coolant is returned to the engine jacket to repeat its cooling-heating cycle.

Additional heat will be supplied by electric strip heaters mounted overhead. They warm the air passing into the passenger section and in the duct which introduces outside air. These heaters are essentially strips of steel alloy, heated electrically like the heating element of a toaster and radiating their heat to the surrounding air.

With each car able to provide its own heat, on cold winter days, heat requirements no longer will be a limiting factor on the length of trains, Mr. Hanft said.

• **AIR CLEANED.**—Before passing through the cooling and dehumidifying coil in the evaporator section, the entire air supply may be electrostatically cleaned by a Precipitron. Whether the air has been cooled, heated, or dehumidified, before entering the passenger space it may be exposed to slender Sterilamp germicidal tubes, which radiate ultraviolet rays deadly to bacteria found in the air.

WEATHER PREDICTION

may be aided by new technique for measurement of total stratosphere ozone.

It is well known that the variation in the total amount of ozone in the stratosphere has a direct correlation with latitude and season, and that different types of air masses show variations in ozone content which are associated with their origin or movement. However, it is not known at present whether any direct relationship exists between such ozone variations and current weather conditions. The development of a suitable technique for routine measurement of total ozone is of great interest in order to establish possible correlations between ozone concentrations and weather phenomena. If such correlations do exist, ozone data may become very useful in weather forecasting.

• **SPOT CHECK.**—At the request of the Naval Research Laboratory, Ralph Stair of the National Bureau of Standards recently made total-ozone measurements of the stratosphere over the Organ Mountains in New Mexico by means of ground-based equipment employing a photocell and selected filters. This method serves as a check upon ozone determinations by V-2 rocket flights from White Sands Proving Ground. The technique developed by the Bureau makes use of phototubes sensitive to ultraviolet radiation of wavelengths under 3400 Angstrom units and filters with transmittances beginning at 2900 to 3100 *A* and increasing with wavelength. Since ozone is strongly absorbing within this region, the spectral energy distribution of sunlight reaching the earth's surface is greatly affected by its presence. Hence, when the transmittances of the filters are measured for sunlight (using the phototube as a detector), the observed value depends upon the solar energy distribution, and, therefore, is a function of the amount of ozone within the beam of sunlight under study.

In the investigation at San Augustine Pass in the Organ Mountains, two phototubes and four filters were employed, providing eight independent determinations of the ozone value for the period of June 29 to July 4, 1947. A mean value was observed for continental tropical air, a higher value for a polar air mass, and a lower value for a tropical maritime air mass.

Additional measurements during the week of December 15, 1947 should give a winter value for total stratosphere ozone at the same location (report to be published after analysis of data). Positive conclusions of the ozone-weather relationship can be made only after more comprehensive data have been obtained and analyzed from many different observing stations. It is understood that such a project is being planned by the Weather Bureau.

While extensive details are involved in the development of calibration curves and data for a certain phototube and set of filters, the Bureau's method becomes simple for routine operation at a particular observing station, after the original calibration data and curves have been prepared. Furthermore, since the auxiliary equipment consists only of a simple direct-current amplifier, the equipment for this type of work is inexpensive, and easily assembled and transported to suitable observing stations. The method is therefore recommended where routine measurements of ozone concentration are to be made at widely distributed stations.

HEATED RESILIENT FLOORING

under three-year test gives linoleum and asphalt tile green light as radiant floor panel covering – within limits.

Results of exhaustive three-year tests by the Armstrong Cork Co. Research Laboratories indicate that resilient flooring materials for use over radiant heated subfloors can be selected by much the same standards as for over subfloors in rooms where convector-type or conventional heating systems are installed.

Observations were made of all types of resilient floors installed over various types of radiant heated subfloors. Tests showed the effects of varying degrees of temperature on the hardness, composition, and indentation properties of all resilient floorings. Armstrong has been able to make certain specific recommendations as to construction methods for radiant heating installations where resilient flooring is to be used.

• **CONDITIONS.**—One-inch pipe, spaced 12 in. apart and laid on insulating baffles, was used in the experiments. In this type of installation, the water temperatures were varied from 100 to 115 F and the general

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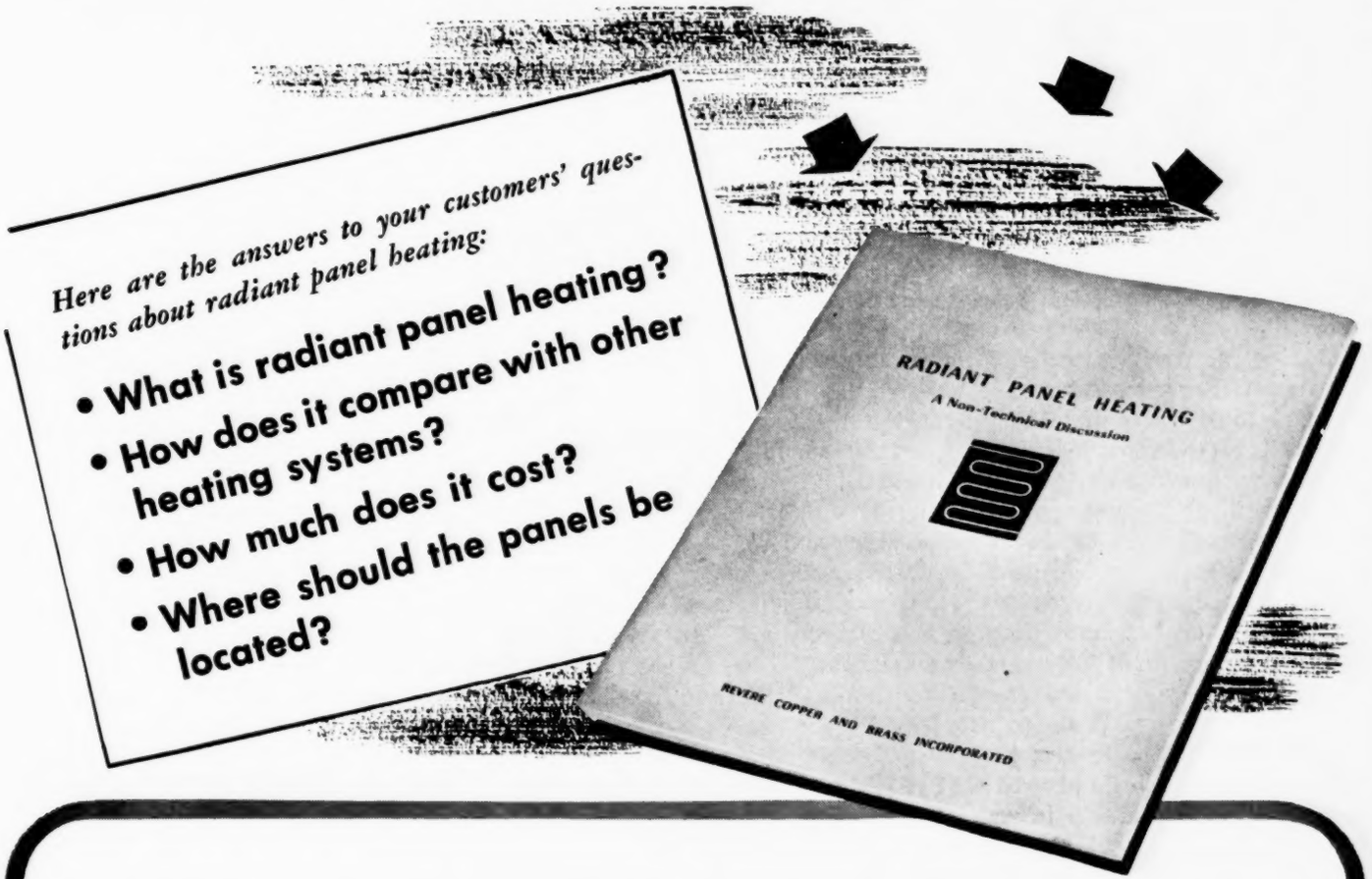
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• How does it compare with other heating systems?
• How much does it cost?
• Where should the panels be located?
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A Non-Technical Discussion
REVERE COPPER AND BRASS INCORPORATED

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floor temperatures from 80 to 85F, with the floor areas directly above the pipe 5 to 6 degrees higher. This was found to be satisfactory for the comfort of the room occupants and the service of the resilient flooring. In buildings where greater pipe diameters, wider spacing, or higher water temperatures are to be used, special flooring recommendations may be required and should be obtained from flooring manufacturers. It is imperative, however, that regardless of the system of radiant heating used, the temperature of the floor surface should not exceed 80 to 85F.

Armstrong conducted the series of experiments by building concrete subfloors in four separate sections. Each section was designed to test various types of resilient flooring under the most extreme conditions that might be encountered with radiant heating on suspended, grade-level, and below-grade concrete subfloors.

During the winter months of the three years when the tests were made, the outside temperatures ranged from 11 to 51F. By maintaining the water temperature at 115F the room temperature varied from 72.5F wth the window open to 90F with it closed.

The resilient floor temperature varied from 83 to 101F depending upon the room temperature and ventilation. A maximum resilient floor temperature of 105F was recorded directly over the heating pipes. The temperature variance between the concrete subfloor and the resilient floor surface was about 1.5 degrees. It should be noted from these findings that resilient flooring materials do not decrease the heating efficiency of the system to any noticeable effect.

• **RESULTS.**—The tests showed that it is desirable to limit water temperatures in radiant heating systems to 120F. Temperatures above this point are uncomfortable underfoot and, in addition, may result in excessive indentation of the resilient flooring, particularly in asphalt tile. While Armstrong Research Laboratory experiments were designed to test resilient flooring under extreme temperature conditions, reports on field installations indicate that, in many cases, constant water temperatures ranging from 85 to 115F are sufficient to maintain comfortable room temperatures.

With radiant heating, as well as with conventional methods of heating, linoleum, Linotile, and rubber tile should be used only on suspended floors or grade-level floors with at least 18-in., well ventilated air space beneath them. Asphalt tile can be specified also for above-grade installations.

The tests showed that radiant heating normally does not create floor temperatures as hot as those resulting from the direct rays of summer sunlight. The same type of furniture rests and cups as normally used can, therefore, be used satisfactorily to protect resilient floor materials that are used with radiant heating.

• **INDENTATION.**—To determine the effect of radiant heat on the indentation properties of the various types of resilient floors, indentation tests were made before and during the period the floors were heated. Using the test loads prescribed by Federal specifications, for each type of resilient floor, it was found that the radiant heated floor temperatures did not increase indentation beyond the specified limits.

Effects of radiant heat on the adhesives used for installing resilient floors also were observed to result in no failure of the resilient floorings or their respective installation adhesives during the course of the experiments.

NEW FUEL SOURCE

will be tapped by process for converting anthracite silt to gas.

A huge new source of fuel will be made available in coming months, it is anticipated by a new process for converting millions of tons of anthracite silt into fuel gas, Frank W. Earnest, Jr. president of the Anthracite Institute announced last month. In another form this gas produced from a hitherto waste anthracite material will provide synthetic petroleum-products and chemical synthetics such as ammonia and methanol.

• **RESOURCES.**—Immediately available are 200 million tons of anthracite silt for such conversion. Since the average annual production of anthracite coal is about 50 million tons, this represents about four years total production of all anthracite. Large additional resources for gas conversion can be anticipated yearly because ten per cent of annual production is silt.

• **PROCESS.**—Anthracite silt, about the size of granulated sugar, has not proved feasible for burning in grates and has accumulated at the mine heads for years. A revolutionary new process, related to the German method for gasifying brown coal, has been the subject of experiments at the Anthracite Institute laboratories in Wilkes-Barre, Pennsylvania.

Anthracite silt, according to Dr. Raymond C. Johnson, vice president in charge of research of the Anthracite Institute, is an excellent fuel for the production of these gases because "it is non-coking, non-caking, free of tar, has a low sulphur content and a high ash-fusion temperature."

• **PRODUCTS.**—The anthracite silt can be processed into three gases, the first two of which are fuel gases. The process for utilizing the anthracite waste product "feeds silt, air and steam into a refractory-lined cylinder," said Dr. Johnson. "Combustion takes place with the silt boiling inside the cylinder while the heavier ash settles to the bottom and is ejected by a rotary grate. The gas obtained is fed through a second bed of burning silt, fortifying it with additional carbon monoxide. The result is producer gas.

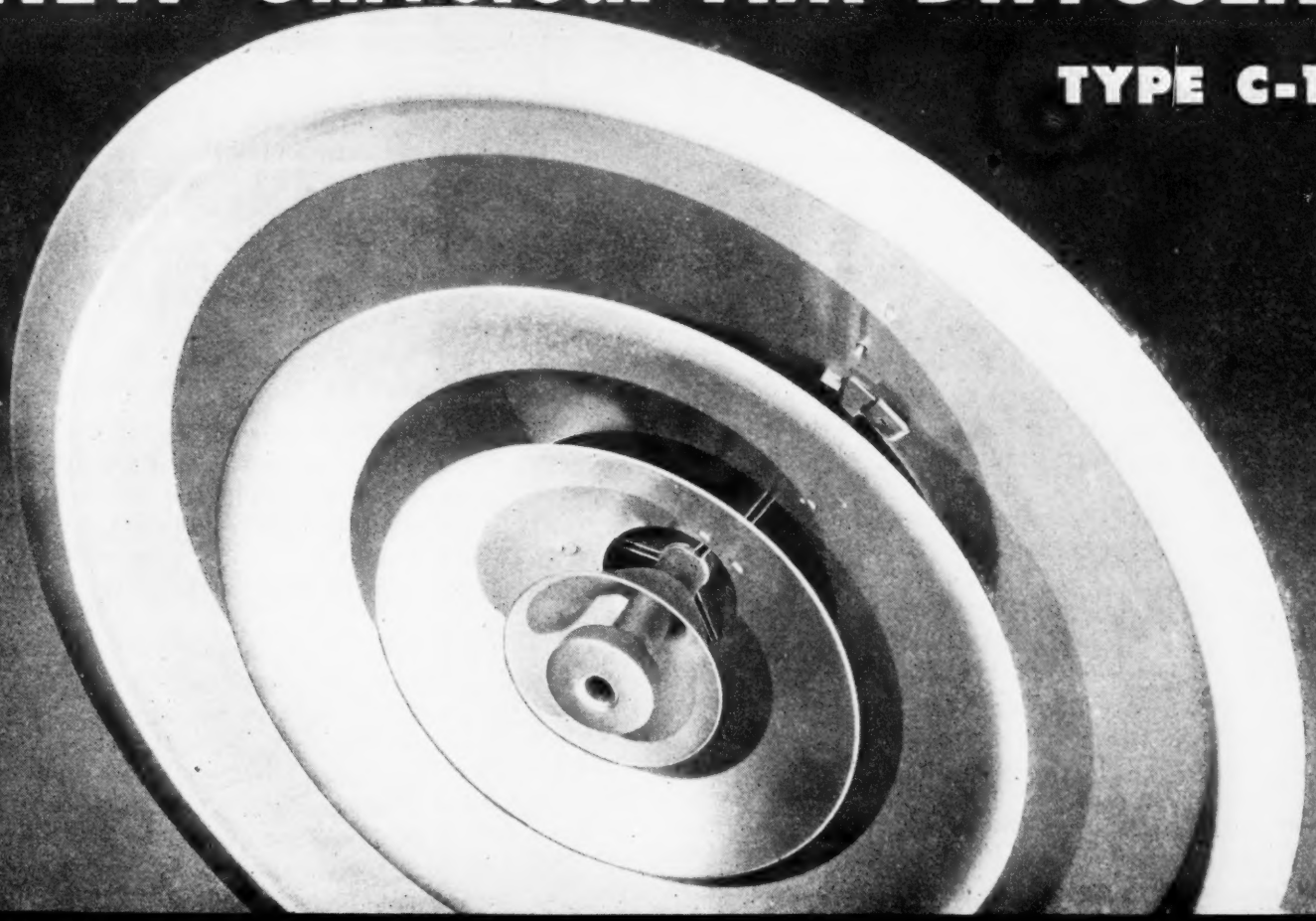
"If gas of higher heat quality is desired," Dr. Johnson said, "steam is forced into the burning silt in the second stage of the process and the producer gas becomes mixed with water gas and develops a higher heat content."

(Concluded on page 138)

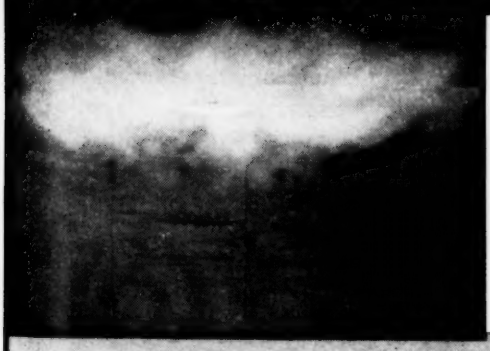
ANEMOSTAT PRESENTS THE

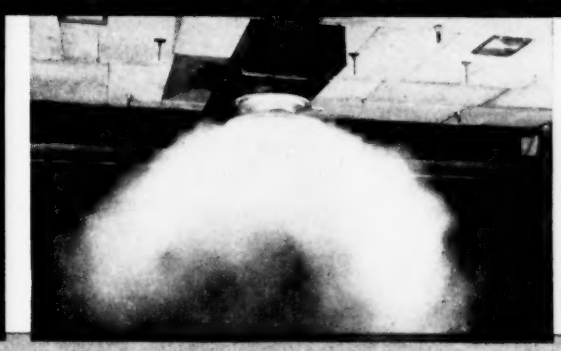
NEW Universal AIR DIFFUSER

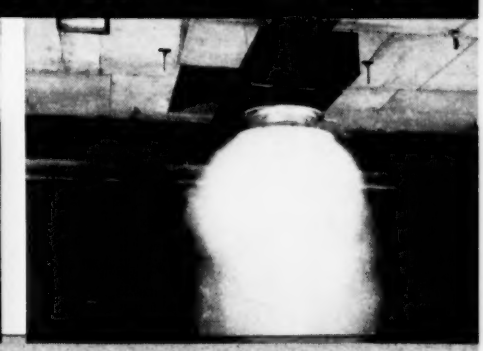
TYPE C-1



ANY DESIRED AIR FLOW PATTERN WITH THE TURN OF A KNOB







These smoke test photographs show three of an infinite variety of air patterns available with the new Type C-1 Anemostat. A slight turn of the knob raises or lowers the third cone thus varying the air discharge from a draftless horizontal pattern used primarily in cooling, to an intermediate downward pattern used in ventilating or to a direct downward discharge used in heating. The C-1 Anemostat functions equally well whether installed flush to ceiling or on exposed duct work.

OTHER IMPORTANT FEATURES!

Employs basic Anemostat Aspiration principle • Designed for heating, ventilating, cooling . . . in any combination. Adjustment may be varied to meet changing conditions of room occupancy, seasonal weather variations or special conditions. • System Balancing is far easier because direct CFM readings can readily be taken in the neck of the Anemostat as the inner assembly is instantly removable. • Newly designed method of fastening inner assembly to outer cone cuts installation time by two-thirds. • Automatic or manual remote controls available. • Provision is made for incorporating volume control or lighting fixtures.

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AC-1

Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

LAW OF CONTRACTS SIMPLIFIED

As a means of avoiding costly litigation and time spent in court because of controversies resulting from faulty or implied points of a contract, Leo T. Parker, attorney-at-law, has compiled valuable legal information for the heating, ventilating and air conditioning engineer. He has collected a number of interesting court decisions to clarify the law of contracts, chattel mortgages and real estate law.

Written in a style for the layman, he presents not only a digest of the important court decisions of the cases cited but he also shows how current law has been interpreted by rulings of higher courts. So little has been written on the legal side of contracts of interest to the engineers of this field, that the information contained in this book should prove of considerable practical value.

The material is divided into five chapters as follows: Law of contracts simplified; the law of municipal contract liability; chattel mortgage and real estate law; legal status of independent contractors; avoiding patent law suits.

Law of Contracts Simplified, by Leo T. Parker. Paper bound, 8½ x 11 in., 26 pages. Published by The Industrial Press, 148 Lafayette St., New York 13, N. Y. Price, $1.

RADIANT HEATING

This book is intended to clarify the general subject of radiant heating for the benefit of prospective home builders, architects and contractors. It may not appeal to the engineer who has basic knowledge of the subject and wishes to add to his data on the design of radiant heating systems.

Although no attempt has been made by Mr. Shoemaker to produce an exhaustive treatise on radiant heating systems, sufficient data has been presented to give an overall concept of the subject. As compared with some of the books already published on radiant heating, it has much more information on heating plants. The author has drawn heavily on outstanding manufacturers of boilers and appliances for radiant heating, for much of his facts.

Of the 10 chapters, one is concerned with precise method of designing radiant heating systems, and another deals with radiant cooling. Some of the other chapters are general considerations; structural and other advantages; panel location in commercial buildings; panel location in residences; the radiant heating plant; control systems for radiant heating; design of radiant heating systems, and installation of radiant heating systems.

Radiant Heating, by Richard Woolsey Shoemaker. Cloth bound 6 x 9 in., 306 pages. Published by McGraw-Hill Book Co., 330 West 42nd Street, New York 18, N. Y. Price, $4.

CENTRIFUGAL AND AXIAL FLOW PUMPS

A scholarly treatment of the subject of centrifugal and axial flow pumps is presented by Dr. A. J. Stepanoff, development engineer for the Ingersoll-Rand Co. to acquaint the reader with the progress in the art. The author has been actively interested in centrifugal pumps since he entered the pump industry about 20 years ago.

This work covers theory, design and application. Numerous new mechanical, hydraulic, operating and economic problems have been presented with advances of knowledge concerning these types of pumps.

Chapters on the Design of Mixed Flow Impellers for Centrifugal Pumps, Cavitation in Centrifugal Pumps, and Special Operating Conditions for Centrifugal Pumps were evolved from articles that were awarded first prizes by the Hydraulic Institute in annual contests.

Some of the chapters covered include theory of the centrifugal pump impeller; vortex theory of Euler's head; specific speed and design constants; pump casing; axial flow pumps; hydraulic performance of centrifugal pumps; leakage, disk friction and mechanical losses; axial thrust; special problems of pump design and application; shaft design for critical speeds; special problems and applications of centrifugal pumps.

Centrifugal and Axial Flow Pumps, by A. J. Stepanoff. Cloth bound, 6 x 9 in., 428 pages. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price, $7.50.

• • •

PIPE MATERIALS AND THEIR ALLOWABLE STRESSES—Third in a series of ten special booklets dealing with Piping Engineering. Prepared by the Research Staff of Tube Turns, Inc., the 26-page booklet covers basis for setting allowable stresses, application of code allowable stresses, tables of condensed specification requirements and allowable stresses, and a discussion of code allowable stresses. There are comprehensive tables of condensed specification requirements for carbon steel, open hearth iron and wrought iron, alloy steel, and non-ferrous metals. Also included is a table of allowable working stresses for each of these metal classifications. Tube Turns, Inc., Louisville 1, Ky.

Cork Seals for Bottle Caps made better in CONDITIONED AIR

Here is another interesting industrial application of air conditioning, to improve the sealing quality of bottle crowns or caps.

Inside of each steel crown there is a cork seal that forms an air-tight closure on the lip of the bottle. This seal is made from granulated cork that is first combined with a special binder, then formed into a rod and later sliced into thin discs. Here it is important that the temperature and humidity of the surrounding air be controlled to insure the proper reaction of cork and binder.

The Crown Cork and Seal Company use conditioned air to improve this manufacturing process and protect the quality of their seals. Their Baltimore plant is equipped with a central-station system that conditions air and circulates it through ducts made from Beth-Cu-Loy copper-bearing galvanized steel sheets.

Beth-Cu-Loy sheets were selected here for the same reasons that they were chosen for ductwork in hundreds of other industrial plants. They have excellent resistance to corrosion. They are strong. They are easy to form, to cut, and to solder. And Beth-Cu-Loy galvanized steel sheets are priced at very little more than ordinary galvanized sheets.

Bethlehem Steel Company,
Bethlehem, Pa.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

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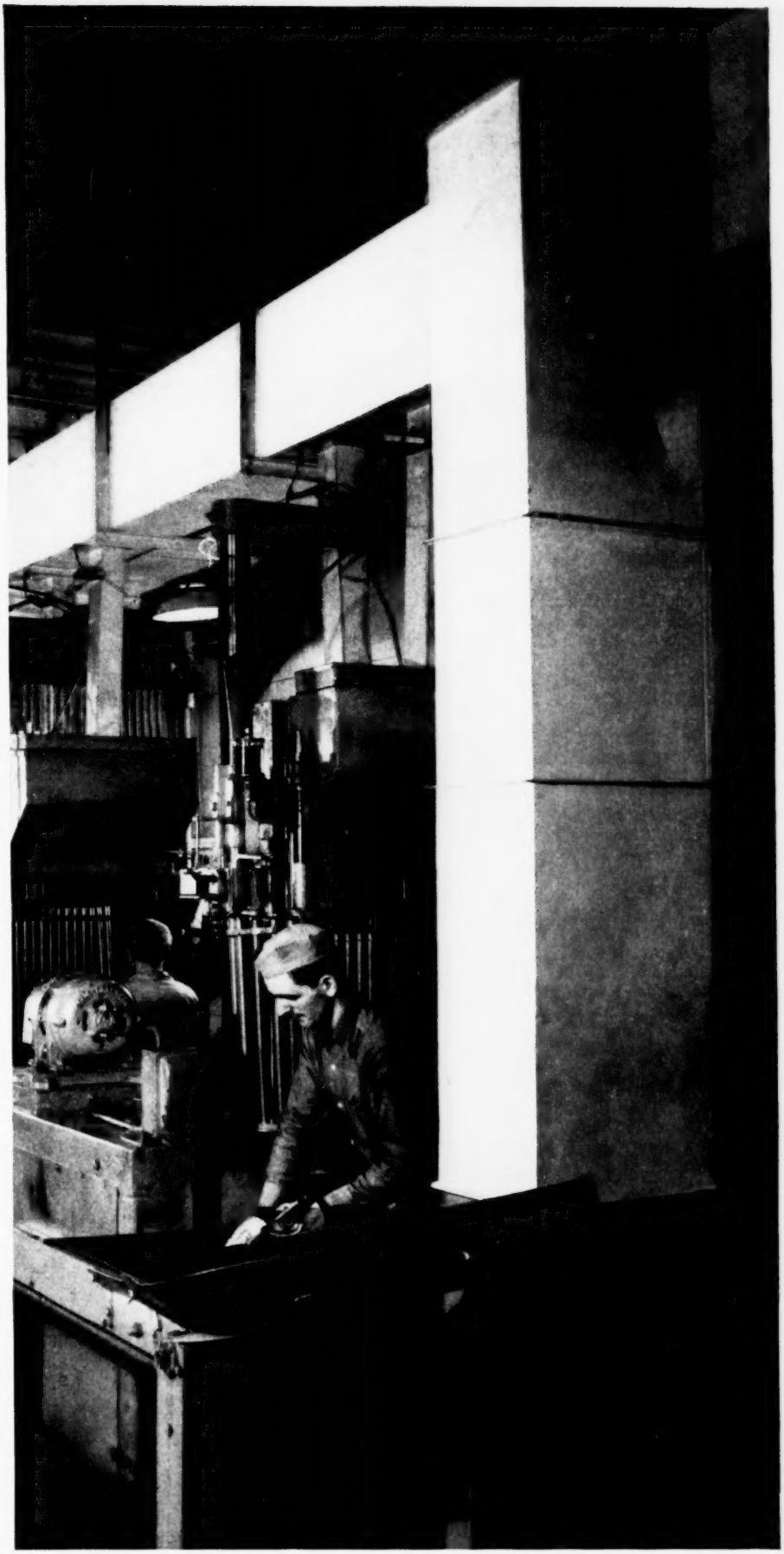
BETHLEHEM STEEL



Air conditioning keeps the mixture of cork and binder at the consistency required for the molding machines in this seal manufacturing plant. The air ducts here are made from Beth-Cu-Loy Sheets.

Beth-Cu-Loy GALVANIZED Steel Sheets

DEGREE-DAYS FOR FEBRUARY, 1948

HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

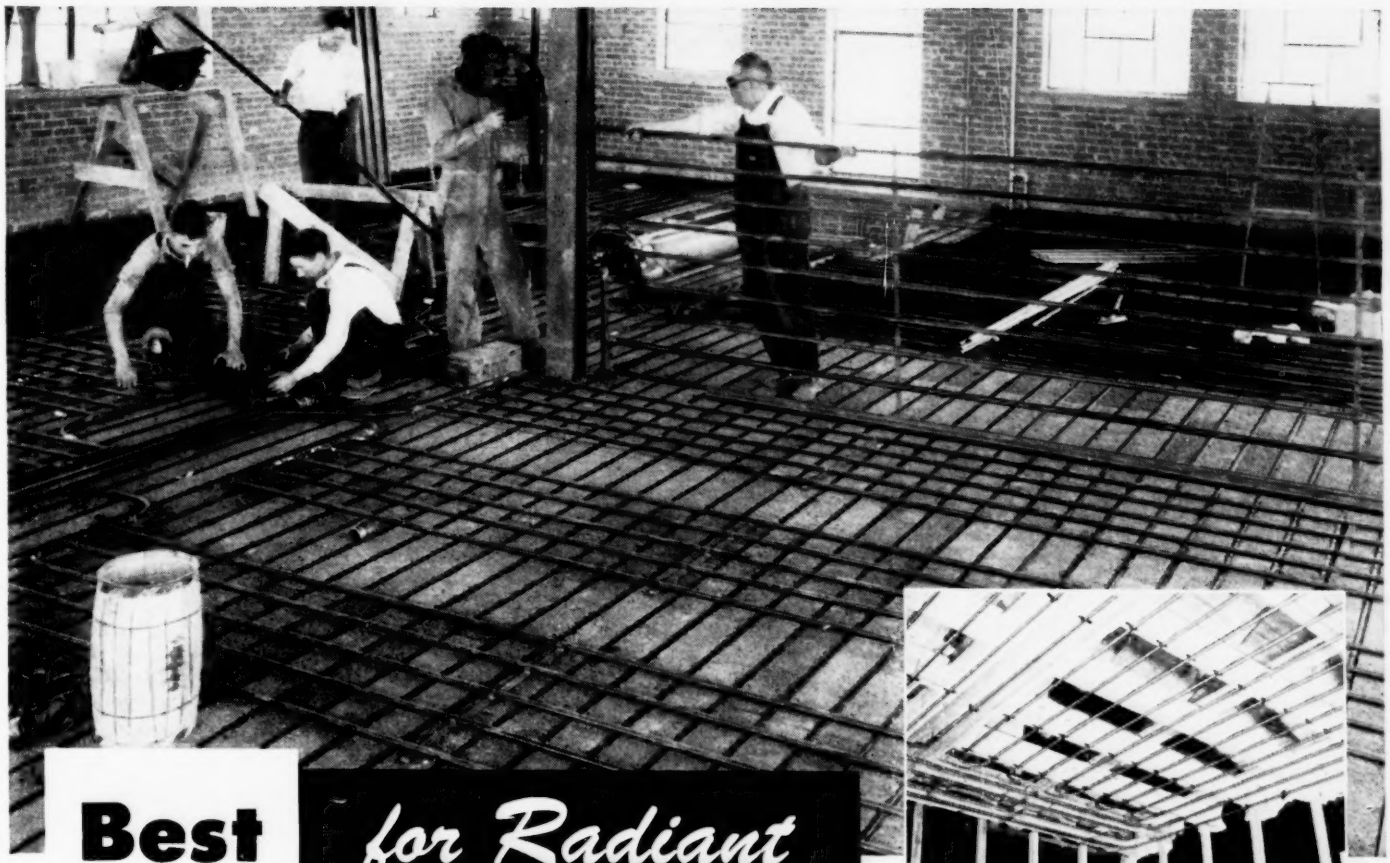
City	February			Cumulative, Sept. 1 to Feb. 29			Heating Season[1]
	1948	1947	Normal	1947-48	1946-47	Normal	Normal
Abilene, Texas	583	637	510	2391	2194	1761	2061
Albany, New York	1355	1224	1142	5536	4677	4868	6580
Albuquerque, New Mexico	791	637	692	3609	3380	3443	4298
Alpena, Michigan	1356	1296	1278	5506	5260	5660	8299*
Anaconda, Montana	1270	1101	1164	5750	6016	5656	8357**
Asheville, North Carolina	598	956	756	3180	2950	3276	4232
Atlanta, Georgia	493	739	557	2453	2143	2370	2890
Atlantic City, New Jersey	885	948	904	3647	2958	3631	5176
Augusta, Georgia	427	608	423	2058	1658	1864	2161
Baker, Oregon	1046	807	991	4673	5093	5024	7163
Baltimore, Maryland	820	928	843	3519	2879	3462	4533
Billings, Montana	1223	1138	1120	5106	5340	5254	7119
Binghamton, New York	1206	1191	1182	5029	4264	4965	6808
Birmingham, Alabama	459	734	521	2396	2090	2023	2352
Bismarck, North Dakota	1684	1495	1548	6839	6577	6869	9192
Block Island, Rhode Island	1038	965	983	4068	3389	3767	5788
Boise, Idaho	955	752	848	4313	4540	4230	5552
Boston, Massachusetts	1118	992	1042	4501	3739	4322	6045
Bozeman, Montana	1248	1059	1208	5776	5701	5897	8521**
Buffalo, New York	1153	1216	1156	4898	4335	4768	6822
Burlington, Vermont	1450	1362	1294	5930	5219	5496	7514
Butte, Montana	1333	1154	1143	6177	6336	5635	8235**
Cairo, Illinois	762	916	762	3301	2813	3169	3909
Canton, New York	1444	1384	1328	6044	5436	5842	8020
Charles City, Iowa	1312	1401	1273	5650	5261	5728	7588
Charleston, South Carolina	415	525	372	1721	1241	1491	1769
Charlotte, North Carolina	593	763	588	2731	2239	2533	3120
Chattanooga, Tennessee	533	826	602	2780	2568	2559	3118
Cheyenne, Wyoming	1190	1152	1075	5223	5183	5179	7466
Chicago, Illinois	1050	1192	1039	4516	4114	4401	6077
Cincinnati, Ohio	822	1030	862	3701	3185	3675	4684
Cleveland, Ohio	1056	1186	1075	4571	3998	4441	6155
Columbia, Missouri	940	1029	897	3846	3517	3903	4922
Columbia, South Carolina	487	630	498	2206	1705	2000	2364
Columbus, Ohio	939	1144	980	4179	3667	4113	5398
Concord, New Hampshire	1410	1197	1240	5804	5086	5321	7353
Concordia, Kansas	1070	1026	970	4260	4013	4173	5315
Dallas, Texas	534	590	493	2270	1905	1980	2256
Davenport, Iowa	1127	1245	1140	4775	4340	4825	6289
Dayton, Ohio	1017	1201	980	4518	3944	4043	5264
Deer Lodge, Montana	1231	1006	1175	5704	5711	6069	8672**
Denver, Colorado	1012	962	918	4246	4164	4273	5874
Des Moines, Iowa	1183	1289	1173	4840	4590	4935	6384
Detroit, Michigan	1178	1105	1134	4866	3069	4718	6490
Devils Lake, North Dakota	1772	1632	1551	7411	7219	7371	9970
Dodge City, Kansas	1031	932	890	4133	3832	3958	5035
Dubuque, Iowa	1215	1310	1218	5143	4744	5194	6790
Duluth, Minnesota	1566	1508	1464	6858	6618	6680	9483
Eastport, Maine	1364	1102	1232	5473	4971	5502	8520**
Elkins, West Virginia	884	1221	991	4412	4017	4256	5697
El Paso, Texas	471	428	434	2417	2252	2101	2428
Ely, Nevada	1187	846	(a)	5375	5435	(a)	(a)
Erie, Pennsylvania	1064	1163	1098	4426	3877	4434	6273
Escanaba, Michigan	1418	1330	1340	5882	5656	6028	8771
Evansville, Indiana	869	1044	854	3833	3351	3348	4244
Fort Smith, Arkansas	658	795	630	2851	2540	2657	3147
Fort Wayne, Indiana	1115	1241	1098	4875	4355	4503	5925
Fort Worth, Texas	519	592	498	2279	1931	1904	2148
Fresno, California	463	353	389	2001	2270	1883	2334
Galveston, Texas	314	394	255	1262	1119	938	1016
Grand Junction, Colorado	1011	815	863	4596	4504	4374	5548
Grand Rapids, Michigan	1157	1193	1204	4807	4350	4863	6535
Green Bay, Wisconsin	1398	1355	1358	5849	5434	5778	7825
Greensboro, North Carolina	688	876	678	3219	2740	2845	3529
Greenville, South Carolina	558	762	661	2702	2279	2739	3380
Harrisburg, Pennsylvania	1011	1049	1008	4265	3639	4077	5375
Hartford, Connecticut	1214	1077	1100	4919	4070	4416	6036
Hatteras, North Carolina	492	655	535	1984	1483	1851	2571
Havre, Montana	1421	1385	1450	5638	6379	6388	8700
Helena, Montana	1290	1058	1178	5614	5914	5611	7894**
Houston, Texas	305	421	277	1358	1189	1092	1157
Huron, South Dakota	1496	1387	1340	6319	5792	6075	8004
Indianapolis, Indiana	940	1148	969	4185	3648	4099	5298
Jackson, Mississippi	413	630	(a)	2017	1746	(a)	(a)
Kansas City, Missouri	986	1007	946	3946	3552	3953	4956
Knoxville, Tennessee	594	891	666	2937	2713	2964	3670
La Crosse, Wisconsin	1377	1377	1265	6006	5479	5578	7322
Lander, Wyoming	1305	1129	1155	6508	5731	5666	7947

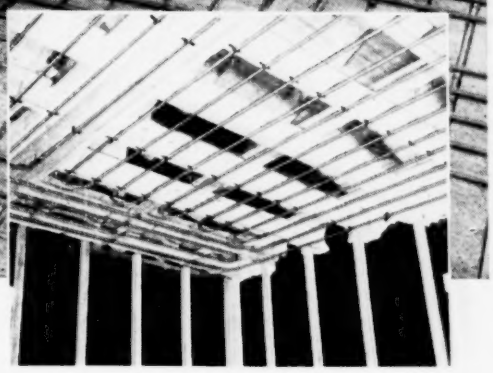
(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with nine exceptions, based on local weather bureau reports. Exceptions are Utica, Lewiston, Sioux City, and Jackson, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; Norman E. Ross, Bursar, Bates College, Lewiston, Me.; Alfred R. Wagstaff, Engineer, Sioux City Foundry and Boiler Co., Sioux City, Iowa, and H. M. Ludlow, Box 1368, Jackson, Miss., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on Page 132]





Best for Radiant Panel Heating

. . . AS WELL AS FOR RADIATORS, CONVECTORS AND RADIANT BASEBOARDS

Radiant heating has taken a firm grip on the interest of both home and industrial builders. More freedom in planning room arrangements—more comfort at lower air temperatures—greater cleanliness—lower operating cost . . . these are a few of the reasons people are asking questions about this *completely concealed* heating.

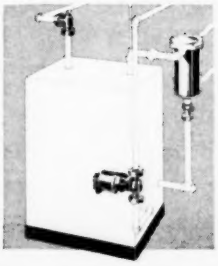
Successful radiant panel heating depends upon the use of comparatively large heating surfaces at *low temperatures!* What other heating method can satisfy these requirements as easily, accurately and economically as B&G *Hydro-Flo* Heat—*a forced hot water system?*

The simple, dependable equipment of a B&G *Hydro-Flo* Heating System positively controls the flow of water through the panels. It smoothly varies the water temperature to meet changes in the weather so that room temperature is maintained constantly at the comfort level. The system circulates water at any level, either above or below the boiler.

Year 'round hot water an added feature

The B&G *Hydro-Flo* Heating System provides an all year 'round supply of low-cost hot water for every household use. Remember that automatic clothes washers, disn washers and showers call for liberal quantities of hot water . . . that's why the economy of B&G water heating is a big selling feature! No separate heater needed—the same boiler that heats the house also heats the water for kitchen, laundry and bath.

If you haven't complete information on B&G *Hydro-Flo* Heating Systems, write today.



B&G *Hydro*-Flo Heating equipment can be installed on any hot water heating boiler.

Hydro-Flo* HEAT

BELL & GOSSETT COMPANY

Dept. AM-4, Morton Grove, Illinois

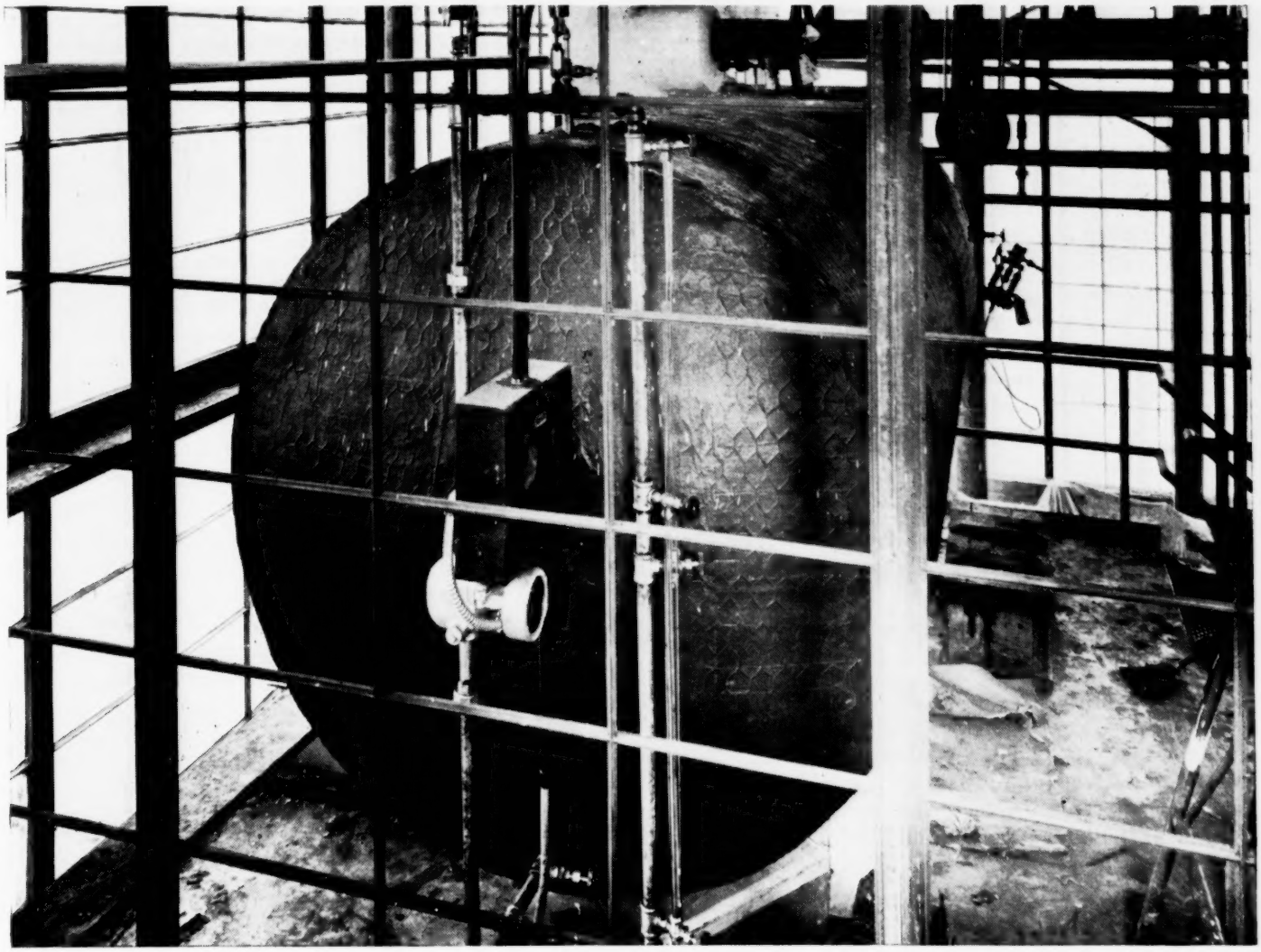
*REG. U. S. PAT. OFF.

Degree-Days for February, 1948 (Concluded)

HEATING AND VENTILATING'S 21st Year of Publication of Monthly Degree-Day Data

City	February			Cumulative, Sept. 1 to Feb. 29			Heating Season[1]
	1948	1947	Normal	1947-48	1946-47	Normal	Normal
Lansing, Michigan	1220	1239	1201	5235	4630	5202	7048
Lewiston, Maine	1386	1127	1243	5610	5217	5532	7707
Lincoln, Nebraska	1145	1129	1131	4673	4282	4643	5999
Little Rock, Arkansas	658	758	582	2724	2361	2380	2811
Livingston, Montana	1192	1061	1067	5220	5434	5018	7245**
Los Angeles, California	308	155	266	984	971	1016	1504
Louisville, Kentucky	810	1006	801	3560	3081	3327	4180
Lynchburg, Virginia	746	955	730	3473	2981	3413	3980
Macon, Georgia	407	602	462	2077	1743	1908	2201
Madison, Wisconsin	1321	1344	1299	5612	5071	5557	7429
Marquette, Michigan	1365	1318	1361	5853	5609	5915	8693*
Memphis, Tennessee	659	799	599	2839	2389	2470	2950
Meridian, Mississippi	412	632	456	2057	1804	1891	2160
Milwaukee, Wisconsin	1184	1331	1201	5231	4946	5185	7245
Minneapolis, Minnesota	1430	1408	1400	6158	5722	5950	7850
Modena, Utah	1076	742	905	5010	4662	4764	6562
Montgomery, Alabama	325	572	392	1797	1504	1676	1884
Nantucket, Massachusetts	1037	959	974	4261	3577	3912	5957
Nashville, Tennessee	667	917	675	3106	2674	2850	3507
New Haven, Connecticut	1148	1047	1011	4611	3849	4230	5895
New Orleans, Louisiana	235	392	230	1253	967	965	1024
New York, New York	970	1006	953	3985	3313	3837	5274***
Nome, Alaska†	1953	2302	1990	7145	7569	7226	14580**
Norfolk, Virginia	638	782	650	2679	2100	2583	3350
North Head, Washington	682	519	622	3002	3229	3132	5452**
North Platte, Nebraska	1072	1078	1020	4621	4615	4806	6366
Oakland, California	492	375	403	2076	2226	2029	3143**
Oklahoma City, Oklahoma	773	760	742	3082	2730	2986	3613
Omaha, Nebraska	1154	1213	1126	4808	4481	4765	6131
Oswego, New York	1231	1194	1162	5018	4429	4933	7088
Parkersburg, West Virginia	819	1081	879	3850	3307	3701	4775
Peoria, Illinois	1087	1219	1067	4645	4297	4673	6109
Philadelphia, Pennsylvania	914	978	881	3771	3078	3542	4737***
Phoenix, Arizona	322	142	263	1377	1175	1253	1405
Pittsburgh, Pennsylvania	881	1204	944	4259	3768	3947	5235
Pocatello, Idaho	1030	846	986	4989	5037	4853	6655
Portland, Maine	1355	1129	1162	5438	4982	5088	7218
Portland, Oregon	655	473	644	2842	3025	3174	4469
Providence, Rhode Island	1092	982	1070	4394	3658	4316	6015
Pueblo, Colorado	1105	957	916	4505	4366	4140	5514
Raleigh, North Carolina	640	785	630	2863	2256	2605	3234
Rapid City, South Dakota	(a)	1245	1119	(a)	5385	5140	7118
Reading, Pennsylvania	982	1018	980	4096	3440	4082	5389
Red Bluff, California	(a)	355	(a)	(a)	2158	(a)	(a)
Reno, Nevada	943	645	823	4290	4192	4149	5892
Richmond, Virginia	697	862	695	3202	2576	2906	3695
Rochester, New York	1213	1219	1159	5045	4412	4825	6732
Roseburg, Oregon	654	489	605	2953	3183	3090	4428
Roswell, New Mexico	690	647	580	3207	2772	2876	3484
Sacramento, California	488	393	426	2088	2247	2036	2653
St. Joseph, Missouri	1074	1062	974	4300	3831	4121	5161
St. Louis, Missouri	875	1020	854	3708	3237	3652	4585
Salt Lake City, Utah	920	745	885	4373	4500	4144	5555
San Antonio, Texas	372	461	274	1605	1486	1128	1202
San Diego, California	315	185	280	1105	1050	1099	1645
Sandusky, Ohio	1071	1157	1061	4496	3892	4384	6208
San Francisco, California	414	321	465	1699	1899	1770	3264**
Sault Ste. Marie, Michigan	1484	1426	1487	6287	6027	6315	9285**
Savannah, Georgia	330	506	316	1557	1155	1323	1490
Scranton, Pennsylvania	1115	1157	1106	4757	4053	4552	6129
Seattle, Washington	673	514	647	3043	3242	3297	4934**
Sheridan, Wyoming	1296	1185	1160	5415	5498	5789	8008
Shreveport, Louisiana	488	604	412	2134	1796	1736	1938
Sioux City, Iowa	1230	1329	1260	5320	5217	5278	6898
Spokane, Washington	1048	812	952	4812	4839	4707	6355
Springfield, Illinois	965	1101	1008	4093	3768	4191	5373
Springfield, Missouri	893	1016	876	3701	3414	3523	4428
Syracuse, New York	1265	1245	1212	5212	4530	4980	6893
Tacoma, Washington	709	541	675	3304	3487	3438	5181**
Terre Haute, Indiana	962	1141	966	4314	3615	3876	4872
Toledo, Ohio	1141	1204	1075	4886	4276	4467	6077
Topeka, Kansas	1008	1013	935	4020	3663	3953	4969
Trenton, New Jersey	983	1017	941	4076	3345	3715	4933
Utica, New York	1297	1253	1181	5410	4067	4966	6796
Valentine, Nebraska	1214	1205	1130	5209	5202	5225	7039
Walla Walla, Washington	808	650	778	3578	3773	3676	4808
Washington, D. C.	797	933	848	3504	2891	3559	4626
Wichita, Kansas	955	931	896	3780	3474	3773	4673
Williston, North Dakota	1643	1536	1495	6541	6722	6958	9323
Winnemucca, Nevada	956	675	905	4502	4523	4644	6427**
Yakima, Washington	983	719	846	4274	4506	4433	5599

(a) Data not available.
†Some data are for January.
*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.
[1]Figures in this column are normal totals for a complete heating season, September to June, incl.



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It's Fiberglas-insulated—to confine working BTU's where they'll do a useful, fuel-saving job.

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The high thermal insulating efficiency of Fiberglas results from the countless tiny air spaces enclosed in a lightweight, wool-like blanket of long, fine fibers of glass. Here is a material that will not burn, rot or decay—is non-corrosive and will not corrode metals. Fiberglas insulation holds together, is resilient, will not settle under vibration.

This basic material is further processed into blankets that meet the requirements of industry for insulating hot surfaces up to 1000°F. In the illustration, above, Fiberglas insulation has been fabricated with a wire mesh exterior surface to facilitate application and provide a base for mastic finish.

Get all the facts about Fiberglas blankets—their many forms and uses. Write for "Fiberglas Insulations for Industry" . . . Owens-Corning Fiberglas Corporation, Dept. 912, Toledo 1, Ohio. Branches in principal cities.

In Canada: Fiberglas Canada Ltd., Toronto, Ontario.

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NEW CATALOGS

Air Recovery Handbook

An engineering and application data book, Bulletin 105-A, covers the Type "H" Dorex air recovery equipment which is used in the recovery or conversion of stale, vitiated, or contaminated air to its original freshness, either in order to conserve it for re-use or to correct exhaust and intake odor nuisances. Dorex Type "H" equipment consists essentially of hollow-walled cylindrical canisters containing specially processed activated carbon and a manifold or supporting plate in which the canisters are secured. It can be installed in a variety of arrangements in ducts or casings to suit different conditions and requirements. Typical assembly arrangements, dimension prints, framing details, capacity and resistance curves are included in the handbook.—*W. B. Connor Engineering Corp., 114 E. 32nd St., New York 16, N. Y.* 53

Radiant Heating Book

"Capture the Sun with B & G *Hydro-Flo* Heating" describes in simple language, with full-color illustrations and diagrams, the application of forced hot water to all forms of radiant heating. The zoning of larger installations in factories, apartments and institutional buildings are pointed out as important benefits of *Hydro-Flo* heating.—*Bell & Gossett Co., Morton Grove, Ill.* 54

Roof Cooling

A 6-page bulletin describes a roof spray system, Ruppright's rotary roof cooler, consisting of a jet of water introduced at an upward angle against the blades of a vertically mounted water wheel. Action of the jet rotates the wheel and disperses the water in a narrow curtain of spray which is swept back and forth over the roof area. Performance diagram and installation details are included.—*Ruppright's Rotary Roof Cooler, Post Office Box 6795, Los Angeles 22, Calif.*.....55

Condensation Pump

Bulletin 14-A, four pages, two colors, describes the Model HS condensation pump consisting of horizontal pump, motor, receiver and float switch mounted on a flat base. A table of engineering data and dimensions is included.—*Skidmore Corp., St. Joseph, Mich.*.....56

Characteristics of Refrigerants

A set of two charts shows the pressure-temperature relationships of 24 refrigerants. One chart covers a temperature range from —40 to 250F, and the other from —180 to 60F. Charts are 8½ x 11 in. and are punched for filing in a 3-ring reference notebook.—*Kinetic Chemicals, Inc., Wilmington 98, Del.* 57

Refrigeration Equipment

A 32-page catalog, No. R-125, with included price list describes and illustrates Kramer refrigeration equipment including coils, condensers, heat exchangers, unit coolers, panel units and water coolers with drawings and tables of performance data and dimensions.—*Kramer Trenton Co., Trenton, N. J.* 58

Valves

The Rockwell line of sliding gate and butterfly valves is described in a looseleaf bound collection of bulletins. Valves are of various types of control in sizes from 1 to 48 inches.—*W. S. Rockwell Co., 200 Eliot Street, Fairfield, Conn.* 59

Vertical Turbine Water Pumps

Full approval by Underwriters' Laboratories, Inc. and Associated Factory Mutual Fire Insurance Companies has been granted to Peerless vertical turbine fire pump, described in Bulletin No. B-152. Affording a reliable water supply for fire protection and especially designed for instant operation even after long periods of inactivity, this type of vertical turbine fire pump is available in capacity ranges from 500 to 2000 gpm to operate against heads from 240 to 285 ft.—*Peerless Pump Division, Food Machinery Corp., 301 West Avenue 26, Los Angeles 31, Calif.* 60

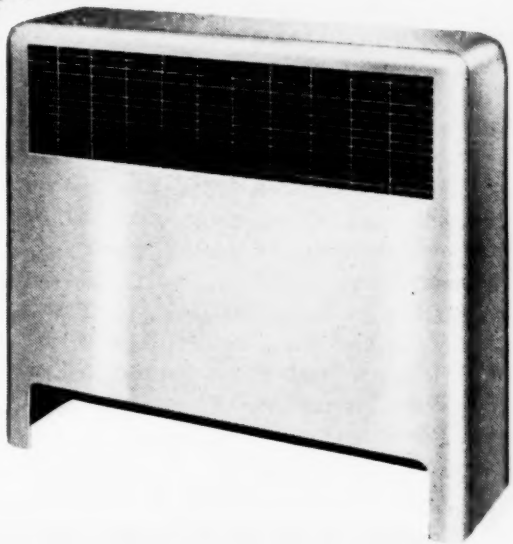
Steam Traps

A 12-page bulletin, No. 1047, features steam traps equipped with bellows of bronze, monel or stainless steel, and bodies in bronze, cast iron and cast steel construction in sizes ¼ to 2 in., for all pressures from vacuum to 300 lb. Included beside capacity tables and dimensions are recommended piping diagrams, typical applications, tables and data covering the selection of traps for various types of steam-using equipment.—*W. H. Nicholson & Co., 12 Oregon St., Wilkes-Barre, Pa.* 61

Valve Capacity Calculator

A valve capacity calculator is offered without charge and is applicable to the new K&M line of Kontrol-Motor diaphragm valves and pressure regulators. The calculator was developed from the results of laboratory tests and is based on three factors: (a) Rate of flow through the valve, or capacity; (b) Static pressure and pressure drop through the valve, or resistance; (c) valve size. Correction scales for steam quality and liquid and gas specific gravity are included as well as a flowing temperature scale for gases. Of circular slide-rule type, the calculator is 8 in. in diameter, has long, open scales that are easily read. It will be sent, with detailed instruction sheet, to design, construction, and process engineers and control valve users requesting it on their company letterheads.—*Kieley and Mueller, Inc., North Bergen, New Jersey.* 62

Clean, Safe, Economical HEATING with AIRTHERM CONVECTORS



AIRTHERM CONVECTORS for hot water and steam heating systems provide the desirable combination of convection and radiant heating. The attractive cabinets can be readily finished after installation in any color to harmonize with interior decorations.

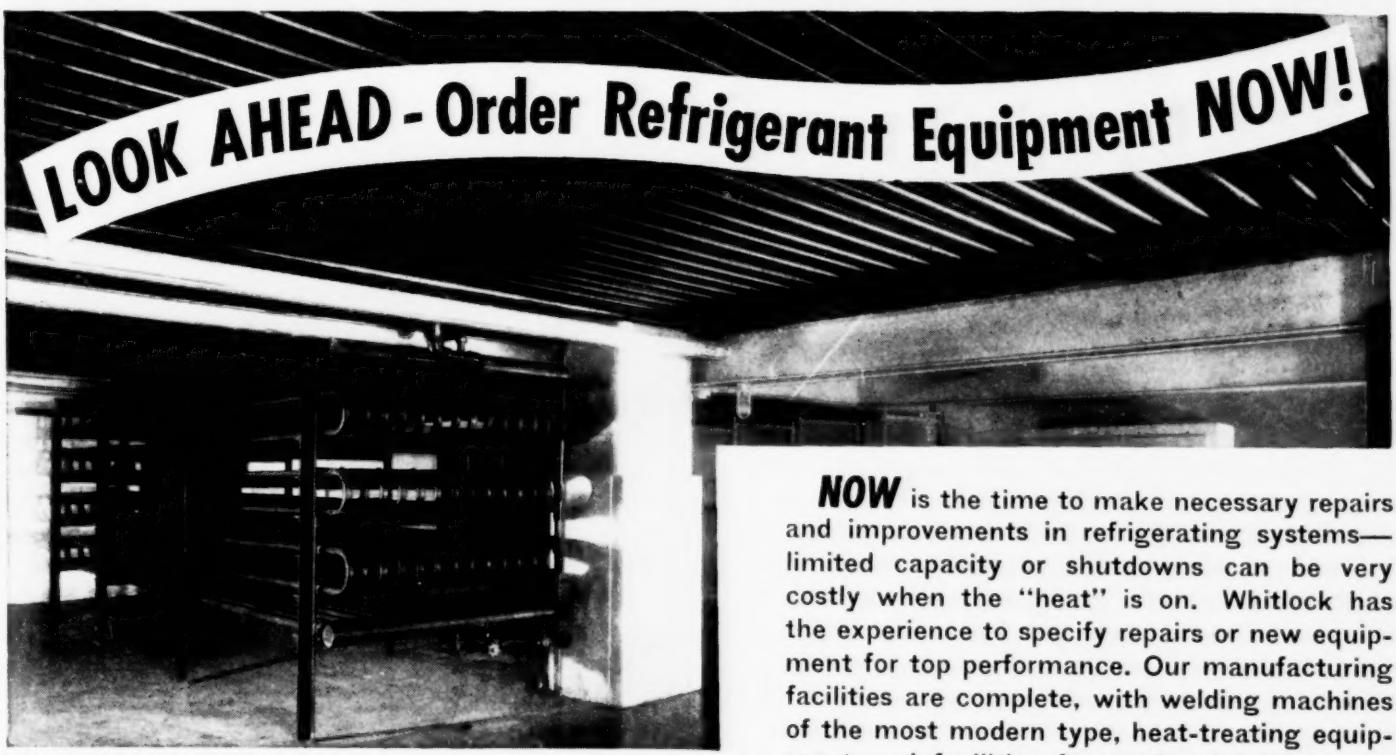
AIRTHERM CONVECTORS are available in three cabinet styles—Type F, free standing or partially recessed; Type W, wall cabinet; and Type S, sloping top wall cabinet—in a complete range of depths, heights, and lengths.

Have you recently investigated the advantages of specifying and installing convectors? Write for new bulletin describing AIRTHERM CONVECTORS.

AIRTHERM MANUFACTURING CO.

722 South Spring Ave. • St. Louis, Mo.

62



NOW is the time to make necessary repairs and improvements in refrigerating systems—limited capacity or shutdowns can be very costly when the "heat" is on. Whitlock has the experience to specify repairs or new equipment for top performance. Our manufacturing facilities are complete, with welding machines of the most modern type, heat-treating equipment and facilities for testing by X-ray and hydrostatic or air pressure. The design and construction of condensers, receivers, welded headers, prefabricated piping, coils and allied products are Whitlock specialties. Ask Whitlock Engineers to help you with your refrigeration problems.

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ESTABLISHED 1891 . . . AHEAD OF THE TIMES FOR HALF A CENTURY

Aluminum Sheet and Plate

A booklet, covering 48 pages of technical information relative to various aluminum sheet and plate alloys, gauges and sizes, has been prepared by Reynolds Metals technical editorial service. Beginning with a discussion of cost factors, the booklet goes into a short outline of the advantages of using coiled or flat sheet. The booklet gives short summaries of such topics as formability, weldability, riveting and joining, brazing, soldering, machinability, and resistance to chemical attack with a short discussion of the alloy most suitable. One of the final sections of the booklet gives an index of specifications for aluminum sheet and plate as listed by the various government bureaus and a number of the nation's leading professional societies. — *Reynolds Metals Co., Aluminum Division, Desk 105, 2500 South Third St., Louisville 1, Ky.* 63

Fuel Conservation Handbook

A 48-page, paper-bound booklet discusses fuel conservation from the point of view of an "automatic heat merchant." Methods of measuring heat loss and estimating fuel consumption, various heat distribution systems, and the several means of producing heat are discussed with diagrams and tables of data. Suggestions for prevention of heat loss are given in the final pages.—*Williams Oil-O-Matic Division, Eureka-Williams Corp., Bloomington, Ill.* 64

Disc Type Valves

Including more than 70 photographs and tables keyed to drawings showing dimensions, a new catalog, No. 17, on butterfly or disc type valves contains 52 pages and index. It shows 11 basic types of R-S butterfly valves, including detailed elevations which reveal manual controls, extended shafts for automatic controls and finned boxes for high temperature service. The tables are keyed to the valve drawings to show dimensions in all sizes from 2 in. to 48 in. A special section, also, is devoted to prime movers, showing a score or more with dimensional data recommended for use with the valves described.—*Department DH. R-S Products Corp., Wayne Junction, Philadelphia 44, Pa.* 65

Stainless Steel Piping Data

A new booklet, "Stainless Steel Piping—Why and Where to Use It," has been written for the reference libraries of piping engineers, by J. D. Mattimore, chief engineer of the product and research division of Tube Turns, Inc. Among the subjects covered are: Five major reasons for using stainless steel piping; types of stainless steels, with a detailed description of types 304, 347, and 316, which a survey indicates should serve 95% of industry's requirements; standardization of pipe and fittings; selection of pipe joints; fabrication by welding, with an explanation of the preferred welding processes. The booklet also contains numerous tables and illustrations—*Tube Turns, Inc., 224 East Broadway, Louisville 1, Ky.* 66

New MGC Products

A 4-page folder presents a review of 25 Motor Generator products that are now for sale including new equipment developed during the past year. Motor generator capacities ranging from ½ to 20 kw, metal-plating equipment available in sizes ranging from 5 to 20 kw; metal coloring and finishing equipment; materials handling equipment; electro-plating; railway battery charging equipment; special battery chargers; electro-power units; buffers and grinders; air compressors, etc.—*Motor Generator Corp., Box DM-785, Troy, Ohio.* 67

Alloy Weldability Directory

Condensation of a U. S. and Canadian engineering survey designed to show weldability of several thousand major and minor commercial alloys, as revealed by type of weld, equipment design, and practical application of special gas and arc welding rods, has been accomplished in an 8-page, 3-color, technical directory recently made available for 1948.—*Eutectic Welding Alloys Corp., 40 Worth St., New York 13, New York.* 68

Foundry Cupola Blowers

Bulletin 120-23-B11, covering foundry cupola blowers of both the rotary positive and centrifugal types, is an 8-page, 2-color booklet that gives the melting rate, with air volume and pressure required, for standard size cupolas. Another table gives performance data on the sizes and types of R-C blowers which are recommended for use on foundry cupolas.—*Roots-Connersville Blower Corp., Connersville, Ind.* 69

Foamglas Pipe Insulation

Properties, dimensions and prices of Foamglas pipe insulation for hot or cold piping are described in a 4-page bulletin.—*Pittsburgh Corning Corp., 632 Duquesne Way, Pittsburgh 22, Pa.* 70

APRIL, 1948

TO OBTAIN COPIES OF TRADE LITERATURE listed in this issue, circle on the list below the publication wanted, using item number at the end of each review.

Print your name and address, mail to
Editor, HEATING AND VENTILATING,
148 Lafayette Street, New York 13, N. Y.

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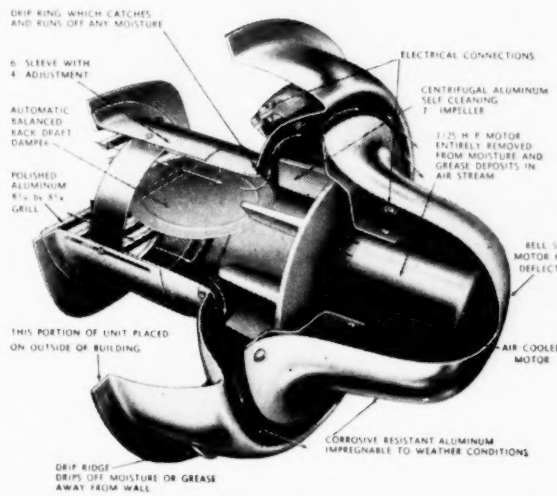
DRIP RING WHICH CATCHES AND RUNS OFF ANY MOISTURE
6" SLEEVE WITH 4" ADJUSTMENT
AUTOMATIC BALANCED BACK DRAFT DAMPER
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1/25 H. P. MOTOR ENTIRELY REMOVED FROM MOISTURE AND GREASE DEPOSITS IN AIR STREAM
BELL SHAPED MOTOR HOUSING DEFLECTS WIND
AIR COOLED MOTOR
THIS PORTION OF UNIT PLACED ON OUTSIDE OF BUILDING
CORROSIVE RESISTANT ALUMINUM IMPREGNABLE TO WEATHER CONDITIONS
DRIP RIDGE DRIPS OFF MOISTURE OR GREASE AWAY FROM WALL

H. E. Honderich, Indianapolis contractor, says:

"Sure, I like the Kitchen-Aire. It's the best ventilating fan I've ever used. The heavy-duty aluminum impeller really moves the air. Motor is out of air-stream, no chance of becoming a fire hazard. Outside mount of operating unit, in fully protected housing, minimizes motor noises and vibration."

"Easy as pie to install. Only 6" opening needed, easy to wire and mount. Readily available 6" duct permits installation in wall or ceiling above the range for maximum ventilating efficiency. Patented back-draft damper is protection against heat loss and wind."

"Intake grill of polished aluminum matches any color. The most advanced engineering design, at a cost LESS than fans not as good."

WRITE FOR PRICES AND LITERATURE

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Holes in "K" flanges are precision drilled on multi-spindle machines

We used to have nightmares about plumbers and steamfitters getting jammed up with misaligned holes in flanged fittings or cockeyed threads in screw fittings.

But now we sleep in peace because we've installed the most modern of precision machinery for drilling and tapping "K" fittings. On top of that, we subject our fittings to the most scientific and most exacting inspection tests.

In short, we produce "K" fittings as if we were going to install them ourselves.

The "K" line of precision-cast, precision-machined, precision-inspected fittings includes:

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- Standard Flanged Cast Fittings
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NEWS OF THE MONTH

NEW FUEL SOURCE

(Continued from page 126)

"In producing synthesis gas which can be made into synthetic liquid fuels or other chemicals the same method of fluidized or boiling combustion bed is used. However, by either intermittently blowing air and steam into the combustion chamber or by using a continuous blast of oxygen and steam, a synthesis gas composed of carbon monoxide and hydrogen is produced."

• **PLANT.**—A pilot plant for converting the anthracite waste products into gases is now under construction at the Anthracite Institute in Wilkes-Barre. First, large-scale use of the gas produced from the silt, Dr. Johnson said, would be to provide fuel to power the anthracite region collieries, where the silt is present in great abundance. This will release commercial sizes of anthracite for shipment to the consumer market.

"Next logical use of gas produced from anthracite silt," said Dr. Johnson, "will be by petroleum processing companies in producing synthesis fuel products, such as gasoline, and by chemical companies in producing synthetic chemical products."

NEWS BRIEFS

• Delivery of the first units on an order for more than *$1 million worth of a packaged boiler unit* complete with oil burner has been started by York-Shipley, Inc., York, Pa., manufacturers of automatic heating equipment, to Levitt & Son, Inc., Manhasset, L. I., N. Y., for use in a building project of 4,000 new homes. Shipments will be at the rate of 400 units per month.

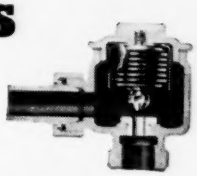
• Said to be the *largest in the world*, the Alford Refrigerated Warehouse, now under construction in Dallas, Texas, will provide *1,000 tons of refrigeration* to 7,500,000 cu ft of cold storage space and 8,000,000 cu ft of air conditioned dry storage space. There will be no floor insulation, but walls and ceilings will have 12 in. of redwood bark. Entire project will cost $5.25 million.

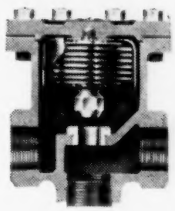
• A comprehensive *research program* to provide technical data on *panel design* has been undertaken by National Tube Co. prompted by a survey showing that engineers are uncertain about data concerning heat transfer within a panel.

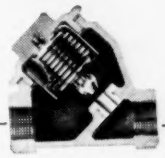
• More than *20 million square feet of new floor space* have been added to America's production plant since VJ day through the offices of Albert Kahn Associated Architects and Engineers, Inc. George H. Miehls, who heads the 44-year old firm, says the new work represents a score of major projects with an industry range including publishing, clothing, and truck plants.

Nicholson Simplicity Enables You to

STOP Adjusting Steam Traps







Nicholson traps require no adjustment or change of valve and seat from 0 to 225 lbs. This feature proves an exceptional trouble-saver in plants with many and varied trap applications. With these other 5 features, it accounts for the increasing standardization on Nicholson traps: 2 to 6 times average drainage capacity; operate on lowest temperature differential; no freeze-ups, air-binding, nor water-logging.

5 TYPES FOR EVERY PURPOSE:

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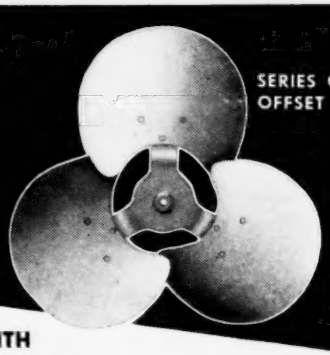
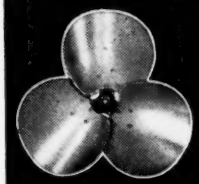


SERIES O OFFSET



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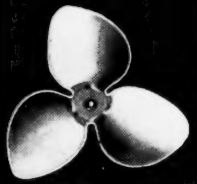
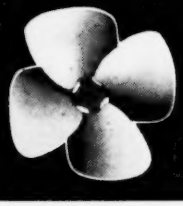


SERIES S ONE PIECE



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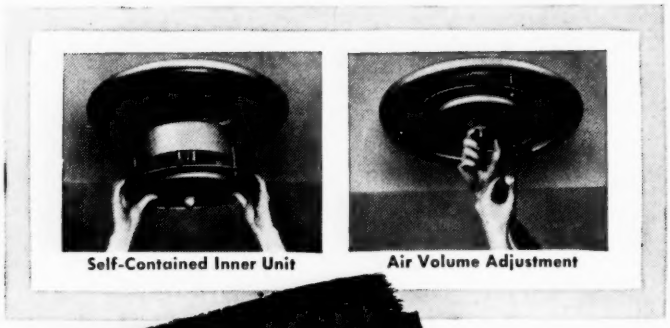

FAST INSTALLATION

"Custom-made" air pattern with Kno-Draft Adjustable Diffusers in Champion Spark Plug Plant

PROBLEM: A ceramic kiln radiates heat on one side and a cold window-filled wall creates drafts on the other. The space is long and narrow with low head room. The occupants work in short sleeves. Unusually large volumes of supply air have to be brought in to combat the heat of the kiln. Space for duct work above the room is limited so that diffusers have to be spaced much closer than usual. The supply air stream has to be directed slightly above the horizontal and evenly distributed so that no drafts are felt by the personnel.

SOLUTION: Kno-Draft Adjustable Air Diffusers were chosen because of their ability to control air direction, volume and throw. A "custom-made" air pattern was created which thoroughly mixed room and supply air, maintained uniform temperature throughout and eliminated drafts, hot spots, and cold spots. *Installation* was fast. Kno-Draft self-contained inner units cut installation time up to 50%. *Balancing* was fast. CFM readings were taken directly with Velometer. A twist of the wrist changes air volume on each diffuser.

Free — **New handbook on Air Diffusion**

It contains the latest engineering data on air diffusion and is profusely illustrated with charts, photographs, sketches and dimension prints that simplify the selection, application, location, assembly, erection, testing and adjusting of Kno-Draft Adjustable Air Diffusers. It is designed to help you get top efficiency from an air conditioning system by creating "custom-made" air distribution patterns.

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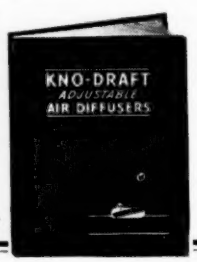

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IN CANADA: Douglas Engineering Co., Ltd., 190 Murray Street, Montreal 3, P. Q.

INDUSTRIAL DEGREE-DAYS
February, 1948

City	55F Base	45F Base
Baltimore, Md.	533	297
Buffalo, N. Y.	863	574
Chicago, Ill.	760	475
Cleveland, Ohio	766	477
Detroit, Mich.	888	598
Indianapolis, Ind.	650	387
New York, N. Y.	680	398
Philadelphia, Pa.	624	354
Pittsburgh, Pa.	593	340
St. Louis, Mo.	591	351

CANADIAN DEGREE-DAYS FOR FEBRUARY, 1948*

City	February 1948	February Normal	Cumulative, Sept. 1 to Feb. 29 1947-48	Cumulative, Sept. 1 to Feb. 29 Normal
Calgary, Alta.	1668	1355	6552	6666
Charlottetown, P.E.I.	1543	1338	5807	5666
Crescent Valley, B.C.	1160	1112	5374	5743
Edmonton, Alta.	1815	1501	7104	7299
Fort William, Ont.	1726	1582	7441	7204
Grand Prairie, Alta.	1850	1456	7268	7456
Halifax, N. S.	1330	1170	5055	5068
London, Ont.	1317	1240	5541	5253
Medicine Hat, Alta.	1656	1406	6283	6438
Moncton, N. B.	1583	1392	6182	6106
Montreal, P. Q.	1543	1460	6233	6108
North Bay, Ont.	1656	1492	6998	6653
Ottawa, Ont.	1580	1459	6430	6382
Penticton, B. C.	1035	969	4584	4779
Porquis Junction, Ont.	1804	1764	7761	8064
Prince George, B. C.	1636	1305	6478	6677
Quebec City, P. Q.	1607	1481	6476	6688
Regina, Sask.	1911	1764	7978	8137
St. John, N. B.	1424	1266	5642	5652
Saskatoon, Sask.	1984	1634	8040	7911
Toronto, Ont.	1199	1206	5014	5154
Vancouver, B. C.	829	736	3826	3797
Victoria, B. C.	742	689	3417	3414
Windsor, Ont.	1204	1148	4958	4877
Winnipeg, Man.	1865	1775	7988	8091

*These data are supplied through the courtesy of the Meteorological Division, Air Services Branch, Department of Transport, Canada, with the cooperation of N. W. Etter, Heating Engineer, Enamel & Heating Products Limited, Sackville, N. B.

The Department reports a slight revision in the figure for January for Charlottetown, P.E.I., as published in last month's issue. Corrected figure is 1448.

WHAT READERS SAY

Testing Ventilating Systems

EDITOR, HEATING AND VENTILATING

In connection with your reference data sheet 357-358 in your January, 1948 issue of HEATING AND VENTILATING, the value of 3,200 which you report in this data sheet for use in determining the rate of air flow in exhaust hoods is accurate only with those hoods that have a coefficient of entry of 0.8. The only hoods having this coefficient of entry are duct ends with flanges at right angles to the axis of flow in the ducts. Most exhaust hoods have a coefficient of entry in excess of 0.9 so that a better round number to cover

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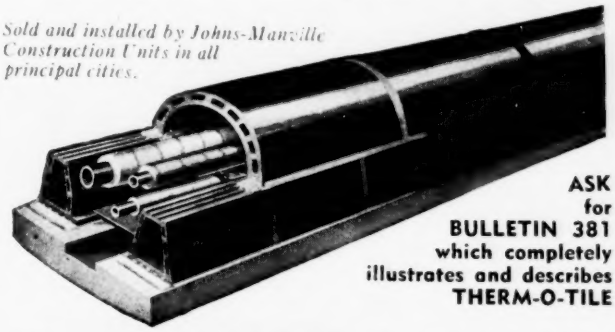

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See Wing Advertisement in last issue of this publication

Dont MEND It BEND It
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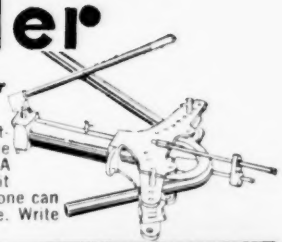
Including New Bend Indicator
It's *Faster, Easier, Cheaper, Neater* for all piping jobs



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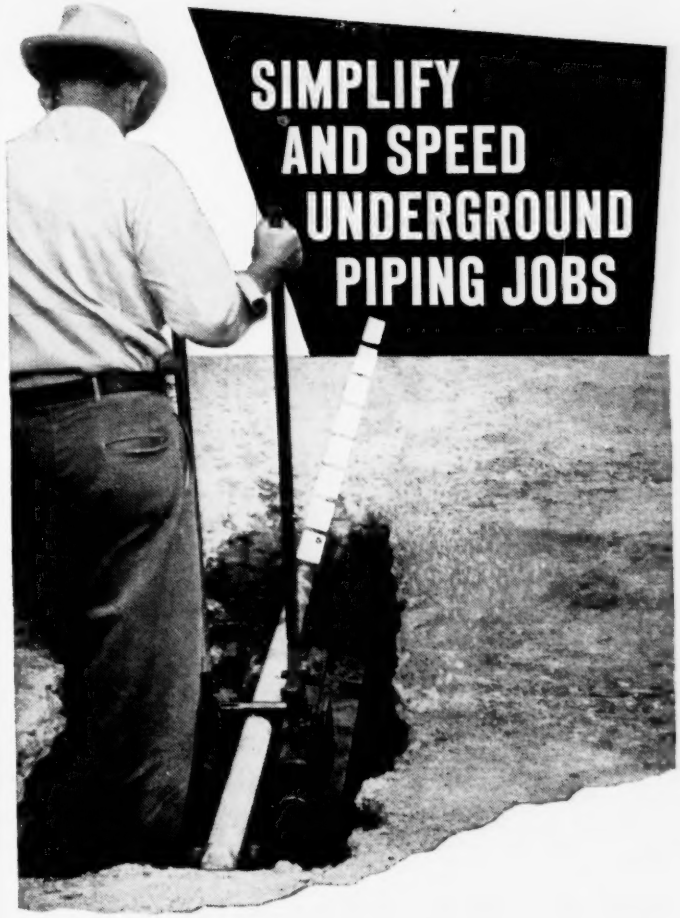
Tal Bender, Inc. Dept. HV-4 Milwaukee 2, Wis.



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all exhaust hoods would be 0.9. Even this value would introduce an error of almost 10% in a number of exhaust hoods and more than that in several, such as flanged exhaust hoods and open end ducts. In my opinion, it would be much better for you to give a small table of values somewhat as follows:

Hood	Coefficient of entry	Value to be used in equation in lieu of 3200
Open end duct (unflanged) . . .	0.71	2840
Flanged duct end	0.80	3200
Hood with tapered sides; included angle not more than 90°	0.93	3720
Hood with tapered sides; included angle greater than 90°	0.87	3480

Results obtained by using values selected from this table will be within plus or minus 5% of the correct values.

Allen D. Brandt
Industrial Hygiene Engineer
Bethlehem Steel Company
Bethlehem, Pennsylvania

Fan Power

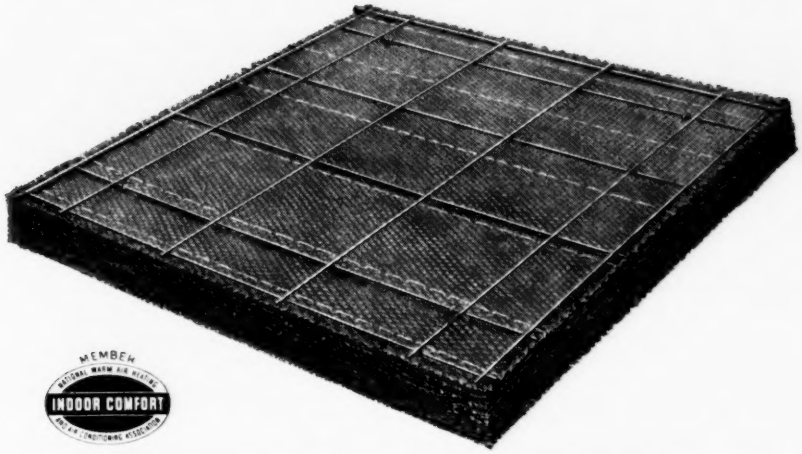
On page 78 of the February issue, in an article entitled "Industrial Exhaust Systems" by E. J. Weiss, an equation appeared showing that the fan speed, motor current and fan capacity were proportional. This is not the case, and the equation should have read

$$\frac{\text{Present fan rpm}}{\text{New fan rpm}} = \sqrt[3]{\frac{\text{measured amperes}}{\text{name plate amperes}}} = \frac{\text{present cfm}}{\text{new cfm}}$$

Getting Personal

G. B. Schubauer (co-author, *Effect of Support on Performance of Vane Anemometers*, page 78) received his A.B. degree from the Pennsylvania State College in 1928 and his M.S. from the Cleveland Institute of Technology in 1930. In 1934, he received his Ph.D. from the Johns Hopkins University. He was made Chief of the Aerodynamics Section of the Bureau of Standards in 1946, having been a member of that section since 1930. In January 1948, he was awarded the Sylvanus Albert Reed Award jointly with Dr. Harold K. Skramstad at the annual meeting of the Institute of Aeronautical Sciences held in New York. Drs. Schubauer and Skramstad were cited for their contributions to the understanding of the mechanism of transition from laminar to turbulent flow of air. Dr. Schubauer developed hot-wire instruments of improved reliability and ruggedness, and succeeded in making measurements at a Mach number of 1.7. He developed a method of measuring

TOPS IN PERFORMANCE



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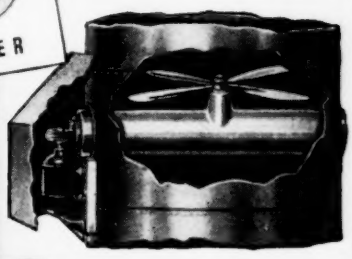

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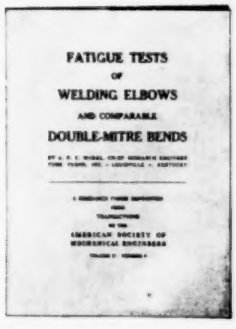

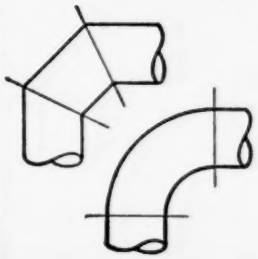

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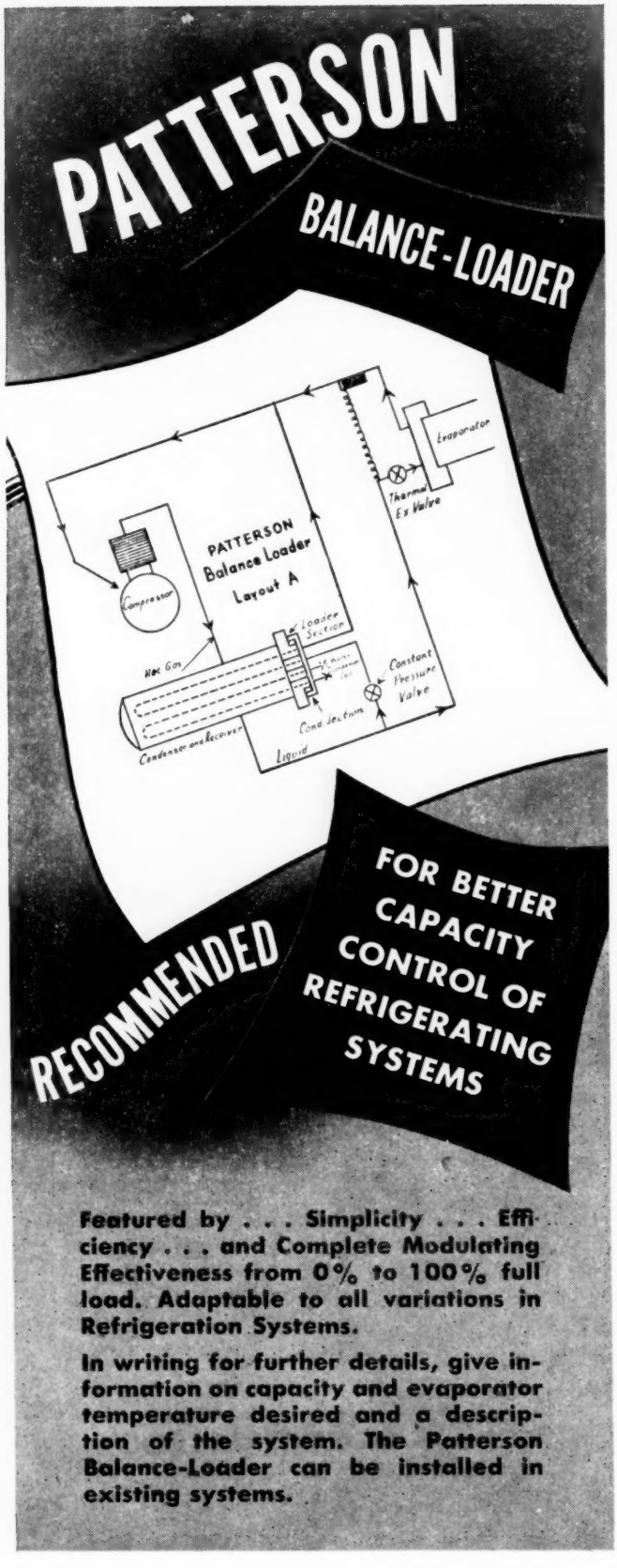
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turbulence based on thermal diffusion, and has made careful and accurate measurements of the velocity in a separating laminar boundary layer.

G. B. Schubauer

G. H. Adams

Gerald H. Adams (co-author, *Effect of Support on Performance of Vane Anemometers*, page 78) was born in Omaha, Nebraska in 1910 and attended Central High and Creighton University of Omaha. He received his B.S. degree "cum laude" in 1932 from Wiley College, Marshall, Texas. After graduate work at the University of Michigan and Howard University he joined the National Bureau of Standards as physicist in aerodynamics in 1942. His special interest has been wind tunnel research. During the war he worked on development of the bazooka and also took part in investigations of aerodynamic characteristics of bombs and other projectiles.

Samuel J. Friedman (*Heat Losses from Tanks, Vats and Kettles*, page 93) was born in Cleveland, Ohio. He received his B.S. degree in chemical engineering from Case Institute of Technology in 1939 and his M.S. from the same school in 1941.

S. J. Friedman

From 1941, Mr. Friedman was a member of the staff of the Engineering Research Laboratory, Engineering Department of E. I. du Pont de Nemours & Co. During the period 1941-47 he worked primarily in the fields of heat transfer and drying. At present he is engaged in industrial engineering field work at the Parlin, N. J. photo products plant of the company.

He is a member of the American Chemical Society and the American Institute of Chemical Engineers.

George M. Hama (*Ventilation for Control of Dust from Bagging Operations*, page 91) was born in Detroit, Mich., and received his early schooling in Minneapolis, Minn. He graduated from the University of Minnesota with a BS in chemical engineering in 1932 and took his MS in chemical engineering in 1934. In 1937 he completed a master's degree in sanitary engineering at Harvard University. He was employed by the Minnesota Health Department from 1932 to 1936 and was granted a fellowship in public health under the Social Security Act in 1936 and 1937. He was employed as a ventilation engineer by the St. Joseph Lead Company and in 1940 became ventilation engineer and field supervisor with

G. M. Hama

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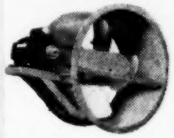

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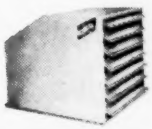
CFM Per Hose
10' = 412 50' = 297



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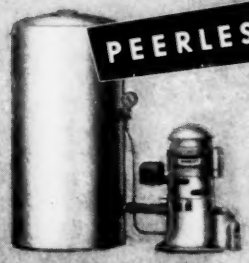
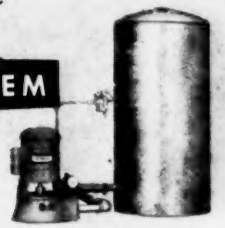
FOR SHALLOW WELLS

PEERLESS Water King



FOR DEEP OR SHALLOW WELLS

PEERLESS JET SYSTEM



IN WATER SYSTEMS

Look to Peerless

FOR PRODUCT QUALITY .
ADVANCED ENGINEERING .
ADEQUATE PROFIT .
COMPREHENSIVE
MERCHANDISING
AND ADVERTISING

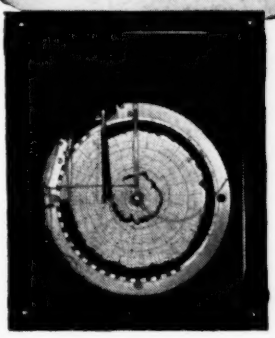
THE PEERLESS MAN will tell you the Peerless story. Write to the nearest district office for full details.

PEERLESS PUMP DIVISION
FOOD MACHINERY CORPORATION

Factories: Los Angeles 31, California; Quincy, Illinois; Indianapolis, Ind.; *District Offices:* Chicago 40, 4554 N. Broadway; New York 5, 37 Wall Street; *Atlanta Office:* Rutland Bldg., Decatur, Georgia; Dallas 1, Texas; Fresno, Calif.; Los Angeles 31, Calif.

PEERLESS PUMPS
fmc

It's Infallible! . . .



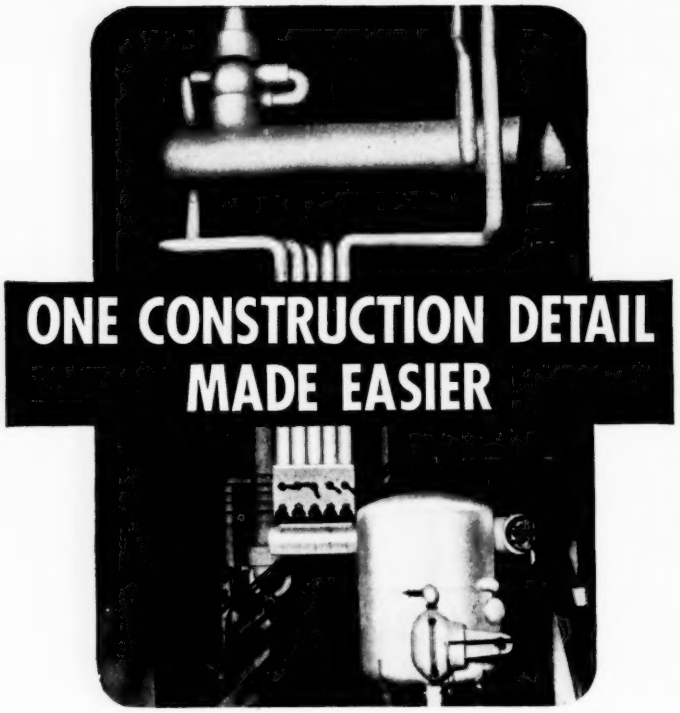
HAYS CO_2 Recorder

Knowing the CO_2 content in the flues is the simple, quick, *best* measure of combustion efficiency—and Hays CO_2 Recorder has no superior for reliable accuracy. It is built to last—no moving parts, nothing to wear out; and is the accepted standard among experienced combustion engineers.

For the facts — readable, exceedingly worth getting

. . . Send for Bulletin 45-452

The HAYS CORPORATION
SINCE 1901
COMBUSTION INSTRUMENTS AND CONTROL
MICHIGAN CITY, INDIANA, U.S.A.



ONE CONSTRUCTION DETAIL MADE EASIER

Here is the new and easier method of finishing lagging material on pipes, ducts, boilers and hot water tanks. Simply adhere the canvas, asbestos, fiberglas, or other non-conducting material, with Arabol Lagging Adhesive.

This product fills your most exacting requirements for both utility and appearance. It is easy to apply; dries in 4 to 6 hours, leaving a sized finish. And this finish need not be painted at all, unless you desire to add one coat for appearance. Labor costs are lower, because you eliminate the slow process of sewing. Maintenance is no problem—grease, oil, soot and dirt wash off easily. And, finally, it is vermin-proof . . . fire-retardant, too.

Extensive tests conducted by independent laboratories have shown just what this product can do under exacting conditions. Arabol was found to retain its adhesive strength despite exposure to extreme temperatures, to immersion in water, and to live steam.

Write us today for detailed facts and figures. Don't place open specifications on lagging work—ask for Arabol Lagging Adhesive. You can depend on it to provide a neat installation — satisfactory in every respect. Also—ask about our cork cement for adhering cork to cork on refrigerator lines.

THE ARABOL MANUFACTURING CO.

Executive Offices: **110 East 42nd St., New York 17, N. Y.**

CHICAGO—54th Ave. & 18th St.,
SAN FRANCISCO—1950 16th St.,
ST. LOUIS—2500 Texas Ave.

Branches in Principal Cities
Factories in Brooklyn, Ciccro, San Francisco, St. Louis

Adhesives ?... **ARABOL!**

the Bureau of Industrial Hygiene, Detroit Department of Health, the position he now holds. His department reports some 2,500 plant investigations a year involving 2,200 ventilation performance tests. During these tests, air determinations for fumes, gases, vapors and dusts are made.

William W. Stalker (co-author, *Control of Atmospheric Dust in the Fire-Brick Industry*, page 73) the acting director of the Division of Industrial Hygiene, Kentucky State Department of Health, received his A. B. in Chemistry and Pre-medicine from Depauw University in 1933. In 1942 he obtained his M. A. in Medical Research from the School of Medicine of Indiana University. Three years later the School of Medicine, University of Louisville, awarded him his M. S.

He has been employed by the Division of Industrial Health since 1943. Mr. Stalker directed field and laboratory phases of the first comprehensive statewide industrial hygiene studies to be conducted in Kentucky—silicious exposures in the refractory brick industry and metallic fume exposures in brass foundries. He is lecturer in Industrial Health and Toxicology, School of Medicine, Department of Preventive Medicine, University of Louisville.

N. E. Schell

W. W. Stalker

R. S. Kneisel

Norman E. Schell (co-author, *Control of Atmospheric Dust in the Fire-Brick Industry*, page 73) is chief engineer, Division of Industrial Hygiene, Kentucky State Department of Health. He received his B. Ch. E. from the Speed Scientific School of the University of Louisville in 1942. Before entering the field of industrial hygiene he was associated with E. I. du Pont de Nemours & Co. in the production of vegetable oils and in the refractories industry.

Richard S. Kneisel, another co-author of this article, is chief chemist, Division of Industrial Hygiene, Kentucky State Department of Health. A native Louisvillian, he received his Bachelor's degree from the University of Louisville in 1941. Following graduation, he entered public instruction. Mr. Kneisel served as a Captain in the Chemical Warfare Service seeing service in the Southwest Pacific for two years. Upon his discharge from active duty in 1946 he joined the Industrial Hygiene Division as Chief Chemist.

. . . Since the Last Issue

Appointment of **W. L. Ledbetter** of Dallas, Texas, as regional manager of the Unit Air Conditioner Division of the **Fedders-Quigan Corp.** of Buffalo, N. Y., has been announced. His headquarters are located at 2303 Roanoke Ave., in Dallas, and he will cover the entire southwestern territory.

Schmidlin Bros. Heating Co., Toledo, Ohio, has been appointed a distributor by **Worthington Pump and Machinery Corp.** for Worthington air conditioning and refrigeration equipment.

CALK all Joints

WITH PECORA COMPOUND

FOR EFFECTIVE

AIR CONDITIONING AND HEAT CONSERVATION

TEMPERATURE control is the vital factor in both air conditioning and heat conservation (fuel saving). Such control is materially aided when calking is provided around all window and door frames and when all building joints are sealed.

The preferred calking material is PECORA. It has been used by reliable contractors since 1908. It is impervious to heat, cold and moisture. Properly applied, it will not dry out, crack or chip.

It will pay you to use this better calking compound . . . and the convenient time and money saving Pecora High Pressure Calking Gun . . described in the folders.

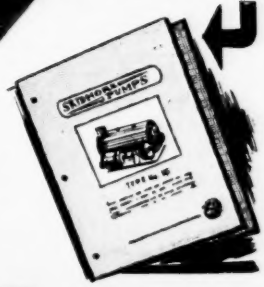
PECORA PAINT COMPANY, Inc.
320 SEDGLEY AVE., PHILADELPHIA, PA.
Established 1862 by Smith Bowen
Member of Producers' Council, Inc.

Something NEW!

Model No. HS

Your Copy is Ready

Bulletin No. 14 A HV contains complete information and engineering data on this new efficient Condensate HS Pump. This pump is used to return condensate to the boiler or other points from all steam heating and process equipment.

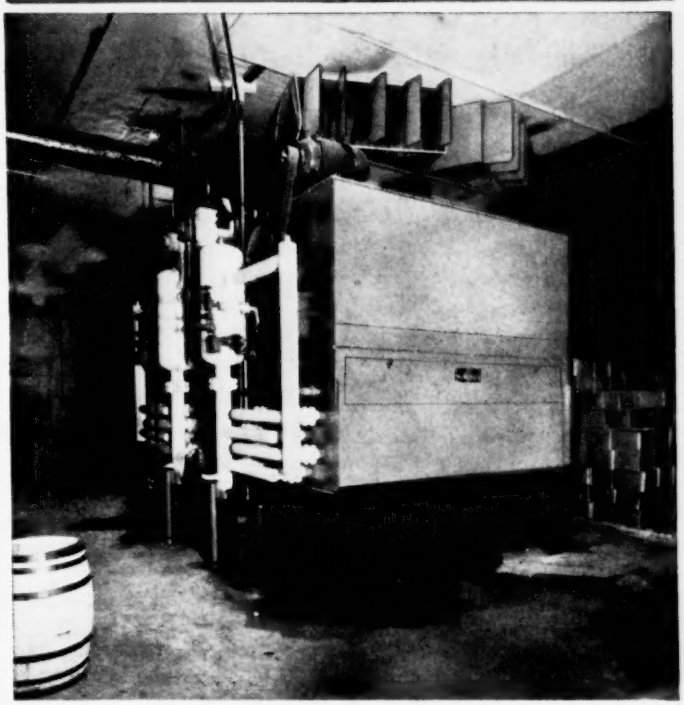


WRITE TODAY!

Skidmore Pumps

ST. JOSEPH, MICHIGAN

"NO FROST" MEANS NEVER WITH THE NIAGARA "NO FROST" METHOD



● Using the Niagara "NO FROST" Method there is NEVER any accumulation of frost and ice on the refrigeration unit. That means NO defrosting . . . none of its troubles and interruption to production.

It also means no loss of capacity such as occurs during the period that frost is forming and building up in thickness on refrigeration coils.

It is a system that gives you always the full capacity your plant was designed for . . . that is, capacity you have never been able to use if frost accumulates.

Niagara "NO FROST" Systems make more money for their owners by increasing production and by operating with lower cost for power.

Write for Bulletin No. 83-HV

NIAGARA BLOWER COMPANY

Over 30 Years of Service in Industrial Air Engineering

405 Lexington Ave. New York 17, N. Y.

District Engineers in Principal Cities

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

"Z"crete*

Cast In Place
UNDERGROUND CONDUITS

Modern Insulation for Underground Piping

Best all 'round!
For Your Underground

MONOLITHIC CONSTRUCTION—No voids or joints to collect moisture. No open structure to be drained or ventilated. Continuous support and alignment for pipes. No guides or rollers required. Free movement of pipes assured by lubricant quality of vermiculite aggregate. Strong structure better than ambient ground eliminates need for concrete box, tile or metal encasement even under extreme traffic conditions.

EFFICIENT INSULATION—Extra thickness, from four to six inches on outside of pipes, assures less heat losses than other methods. Integral waterproofing protects insulation from internal as well as external moisture. System can be satisfactorily installed below water table in ground.

PERMANENT—Only proven materials are used. "Z"-crete Insulation is rot, vermin and rodent proof and will stand temperatures to 2000 degrees F. It will not deteriorate if wetted; is chemically inert and dielectric, providing good corrosion protection. It remains resilient and will absorb shocks from blasting, air hammers and pile drivers without disintegration. "Z"-crete is ideal for installation underground and is permanent as the earth itself.

ASSURED INSTALLATION—Cast in place construction eliminates possibility of injury to insulation during construction or in testings of lines. Insulation is not installed until the hazards are passed. Because we use a preformed aggregate, no special machinery is required, and there is no waiting. The materials are always available. "Z"-crete is furnished and installed under the patents owned and rigidly supervised by the Zonolite Company. You are assured of a satisfactory installation.

INEXPENSIVE—"Z"-crete is less costly to install and no maintenance is ever necessary. It is easy to remove with hand axe or saw for repair to pipes, and simple to replace. It is also an excellent material for the rehabilitation of existing conduits which have gone bad.

SEND FOR FULL DETAILS

ZONOLITE COMPANY
Dept. HV-48, 135 S. LaSalle Street, Chicago 3, Ill.

* "Z"-crete is a registered trade-mark of Zonolite Company

Zonolite Company
Dept. HV-48, 135 S. LaSalle Street,
Chicago 3, Ill.

Please send me full information about the "Z"-crete system for underground pipe insulation.

Name .....

Address .....

City ..... State .....

Announcement has been made of the election of **Leslie P. Hanson**, 42, to the position of vice-president in charge of sales for the **United States Air Conditioning Corp.**, Minneapolis. A graduate of the University of Minnesota, Mr. Hanson has been with the United States Air Conditioning Corp. for 19 years. Starting in the engineering department, he was subsequently promoted to chief engineer and during the war was in charge of the corporation's manufacturing program for the U. S. Navy and the Merchant Marine. He was sales manager immediately prior to his election by the board of directors as vice-president in charge of sales. Three additional personnel changes affecting the executive staff of the corporation were the appointment of **Harold Goodman**, as assistant to the president, **Raymond A. Nelson**, as sales representative for the company in the Twin Cities, and **C. S. Kessler** as manager of the service organization.

L. P. Hanson

General Electric has appointed **C. W. Leegard** to fill the newly created post of commercial engineer, Refrigeration Machine Division. L. H. Matthes, manager of marketing for the G.E. Air Conditioning Department, has announced. A graduate of the University of Minnesota, Mr. Leegard joined G.E. in 1929 at Fort Wayne, Ind., as a test engineer. He held assignments in the Specialty Transformer Division until 1933, when he was transferred to the Refrigeration Division. He was made design engineer in 1934, and was appointed section engineer in charge of all compressor and condensing unit designs in 1940. In 1946 he was named executive engineer at the Fort Wayne plant, and in 1947 he became plant engineer.

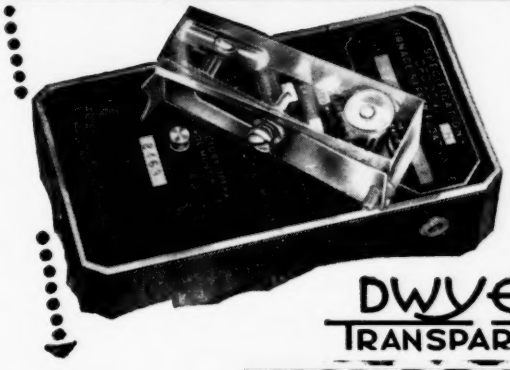
Super Electric Products Corp. of Jersey City, manufacturers of ignition transformers has appointed **William F. Anderson** to the post of director of sales.

John J. Risko has been appointed assistant sales manager of the **Hendrick Manufacturing Co.**, of Carbondale, Pa., manufacturer of perforated metals, screens, and open steel flooring. Mr. Risko attended the Oberlin School of Commerce and studied metallurgy at the Case School of Applied Sciences. For six years he was manager of the sales order department of the S.A.E. Steels Co., Cleveland, and afterward was a salesman for the Columbia Tool Steel Co., leaving the latter position to join Hendrick.

Ray W. Christensen has been appointed assistant advertising manager, Aluminum Division, **Reynolds Metals Co.**, Louisville 1, Ky., according to an announcement by David F. Beard, advertising manager. He succeeds **James C. Bjorkholm**, who was recently advanced to advertising manager of Reynolds Foil Division with headquarters in Richmond, Va. In his new position, Mr. Christensen will concentrate on the advertising and sales promotion for the Aluminum Division, covering such mill products as aluminum ingot; sheet and plate; wire, rod and bar; structural shapes; extruded shapes and tubing; irrigation pipe, etc. He will also handle the advertising for Reynolds Railway and Industrial Machinery Divisions. Mr. Christensen comes to Reynolds from the Girdler Corp. and Tube Turns, Inc., in Louisville where for the last three years he has held the position of assistant advertising manager. Prior to his service with Girdler and Tube Turns he had been sales promotion manager for the Young Radiator Co. in Racine, Wis.

R. W. Christensen

NOW... a Precision Level, Too!



DWYER TRANSPARENT

VISI-DRAFT

with Circular Level

Two

Fine Instruments in

One

Circular Level . . .

gives both direction and amount of leveling necessary

Inclined Tube Draft Gage . . .

gives continuous reading of actual draft changes

The long-famed DWYER Visi-Draft—the only truly pocket-size gage of its kind — now becomes a combination Draft Gage and Precision Level. By the addition of the circular spirit level built into the transparent plastic body, the Visi-Draft determines the level of oil burners and controls. Gets into those tight spaces or cramped corners with ease!

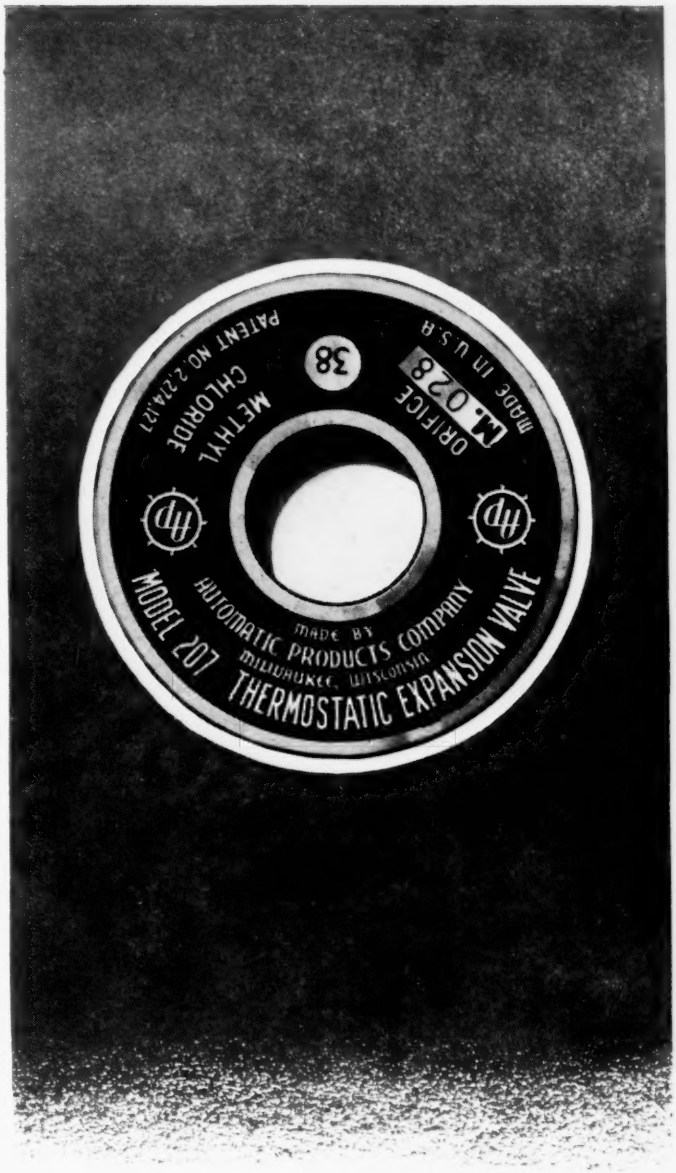
DWYER No. 181 VISI-DRAFT

$7.75

Write for literature

F. W. Dwyer Mfg. Co.

309 South Western Avenue, Chicago 12, Illinois



The Mark of Distinction

ON EVERY

DEPENDABLE

Product

AUTOMATIC PRODUCTS COMPANY

2462 NORTH THIRTY-SECOND STREET

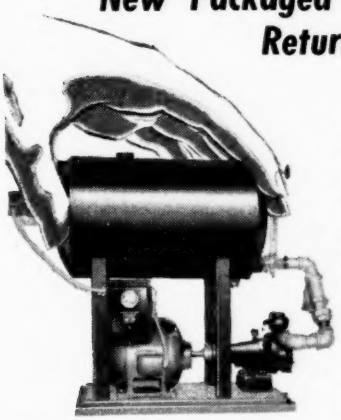
MILWAUKEE 10, WISCONSIN

Export Department, 13 East 40th Street, New York 16, N. Y.

R30IC

Stocked and Sold By Good Refrigeration Wholesalers Everywhere . . . Recommended and Installed By Leading Refrigeration Service Engineers

New "Packaged" Roth Condensate Return Units Offer Greater Flexibility!



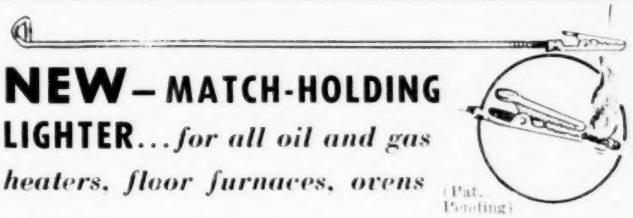
Meet most demands . . . simplify installations . . . save space . . . and assure efficient, economical, service-free performance. Roth pump design simplicity and precision construction insure longer service, lower fuel costs. Capacities range up to 17,000 sq. ft. E.D.R., pressures up to 100 lbs. Also available for boiler feed service. Knockdown units for conversion to boiler feed or return service. Ask for Data Sheets 201 and 202.

Send for price, data sheets, discounts.

ROY E ROTH COMPANY

Turbine Type Pumps and Equipment

Dept. HV, 2436 4th Ave., Rock Island, Ill.



NEW— MATCH-HOLDING LIGHTER... *for all oil and gas heaters, floor furnaces, ovens*

(Pat. Pending)

FEATURES:

(1) Eliminates handling burnt match: merely squeeze clip and release hot match.

(2) Grips paper or wooden match or asbestos tightly:

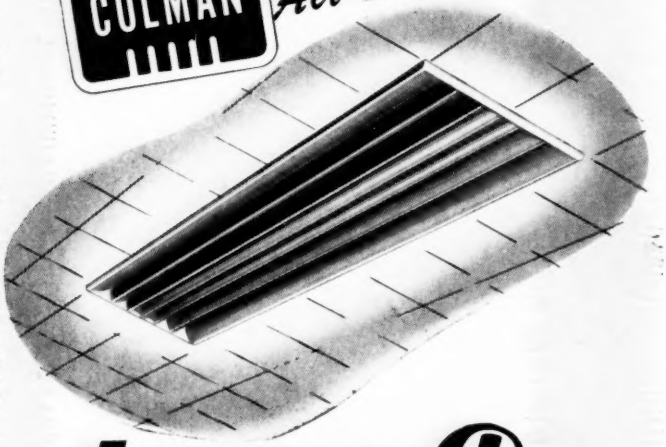
(3) Holds rags for soaking up excess oil in flooded oil heaters; and for cleaning "hard to get at" places.

Available in any length up to three feet at no extra cost. Clip spot-welded to rod handle. ALSO for use with hot water heaters, ovens, or fire places. Guaranteed against defects in workmanship and material. Manufacturers and Dealers, write for free sample and price list.

PORTER MFG. CO., P. O. Box 861 Wilmington, Calif.

BARBER COLMAN

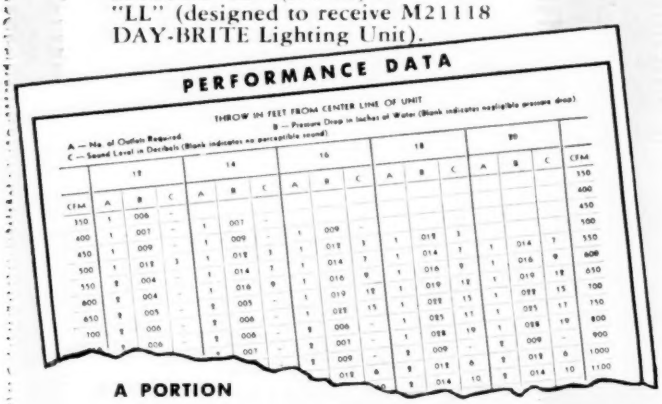
A New Approach to Air Distribution . . .



line-o-flo

CEILING OUTLETS

A new approach to air distribution — *line-type* outlets that can be used singly or end-to-end in continuous strips. Keyed to modern architectural concepts, they provide a vital contribution to continuity of design. High diffusion efficiency results in rapid induction of room air into the primary stream, quickly equalizing the temperature differential. Made in Model "LS" (shown) and Model "LL" (designed to receive M21118 DAY-BRITE Lighting Unit).



PERFORMANCE DATA

THROW IN FEET FROM CENTER LINE OF UNIT

A — No. of Outlets Required
B — Pressure Drop in Inches of Water (Blank indicates negligible pressure drop)
C — Sound Level in Decibels (Blank indicates no perceptible sound)

CFM	12			14			16			18			20			CFM
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	
350	1	.006														350
400	1	.007		1	.007											400
450	1	.009		1	.009		1	.009								450
500	1	.012	3	1	.012	3	1	.012	3	1	.012	3				500
550	2	.004		1	.014	7	1	.014	7	1	.014	7	1	.014	7	550
600	2	.004		1	.016	9	1	.016	9	1	.016	9	1	.016	9	600
650	2	.005		2	.005		1	.019	12	1	.019	12	1	.019	12	650
700	2	.006		2	.006		1	.022	15	1	.022	15	1	.022	15	700
750	2	.006		2	.006		2	.006		1	.025	17	1	.025	17	750
800	2	.007		2	.007		2	.007		1	.028	19	1	.028	19	800
850				2	.008		2	.008		2	.009		2	.009		850
900				2	.009		2	.009		2	.012	6	2	.012	6	900
950				2	.012	6	2	.012	6	2	.014	10	2	.014	10	950
1000																1000
1100																1100

A PORTION OF THE DATA FROM WHICH LINE-O-FLO OUTLETS CAN BE ACCURATELY SELECTED

Knowing the CFM available and the THROW required, the number of standard units needed is quickly obtained from performance data tables such as the one shown in part above.

WRITE FOR COMPLETE DATA...

Ask for Bulletin F-2741 and get full performance data, dimensions, description, principles of operation, typical installation methods, and suggested uses. Write today.

BARBER-COLMAN COMPANY

1224 ROCK ST. • ROCKFORD, ILLINOIS

Engineered Air Distribution with Guaranteed Performance

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Howard C. Shilling has been appointed district manager of the Goshen, Ind., territory of **Penn Electric Switch Co.**, manufacturer of automatic controls for heating, refrigeration, pumps and air compressors. Mr. Shilling joined the Penn sales organization approximately seven years ago. He covered the Chicago territory and later was manager of the company's Moline office until his recent appointment.

Iron Fireman Manufacturing Co. at its annual meeting named **Haskell C. Carter** vice-president in charge of manufacturing. The new position makes Mr. Carter supervisor of production for Iron Fireman's plants at Portland, Cleveland and Toronto, Canada. Mr. Carter joined Iron Fireman 22 years ago in a supervisory capacity. Placed in charge of manufacturing and engineering, he has coordinated Iron Fireman's production and carried out special engineering assignments. Before coming to Iron Fireman he spent one year with Chevrolet Motor Company in engineering and designing, and two years with Ford Motor Company in engineering and production work. He graduated from Oregon State College at Corvallis in 1923.

H. C. Carter

O. B. Wilson has been named industrial manager for the eastern sales region of the **Brown Instrument** division of **Minneapolis-Honeywell Regulator Co.** Mr. Wilson's promotion will make him regional manager of the territory extending from northern Virginia, through eastern Pennsylvania, to the Canadian border, west to Rochester, N. Y., and in New England. He will continue to make his headquarters in New York City where he has been the Brown manager for the past two years.

Raymond T. Doherty has joined the General Division of **York-Shipley, Inc.**, manufacturer of automatic heating equipment, as supervisor of sales to manufacturers and national accounts. Mr. Doherty entered the heating industry in 1928 and has been prominent as a sales engineer and sales executive. In 1942, he volunteered for the U. S. Army Air Forces and served until 1946 in the European theatre. He is a Lieutenant-Colonel in the Air Reserve.

Voluntary dissolution of the committee representing creditors of **General Engineering and Manufacturing Co.**, St. Louis, has been announced by William T. Sutter, Westinghouse Electric Co., chairman of the committee. This action comes as a result of the rapid progress made in the company's financial and sales picture under the direction of Norman B. Schreiber, who was brought into the organization last August as board chairman and general manager. Mr. Schreiber will remain with the company as chairman and general manager. Production and distribution plans for Gemco's heat pump, called Miracula, have been stepped up as a result of widespread interest shown in this development at recent expositions.

Jess M. Fink, identified for many years with the air conditioning industry, has formed a new company under the name of **The J. M. Fink Co., Inc.**, with offices at 125 E. 23rd St., New York, to specialize in the design, engineering and installation of industrial and commercial air conditioning, heating, ventilation and refrigeration systems. Mr. Fink was vice-president and a director of the Consolidated Conditioning Corp., in recent years, prior to which he was with the Carrier Corp. Associated with Mr. Fink as treasurer, is David Bandler, a member of the N. Y. Stock Exchange and formerly executive assistant to the treasurer of L. Sonneborn Sons, Inc., refiners and marketers of oil and oil products.

The appointment of **T. H. Jones** as liquefied petroleum gas specialist was recently announced by **Bryant Heater Co.**, Cleveland, Ohio. Mr. Jones is a veteran of 28 years' experience in the water heater business with the former Hoffman Co., of Louisville, Ky. The new Bryant department head has designed all types of storage, side-arm, continuous flow, and multi-coil gas water heaters, as well as electric and oil-burning storage models. He has served on the board of directors of the Liquefied Petroleum Gas Association as Kentucky representative, and as advisory member on many other important national committees. Bryant Heater has also announced the appointment of **Paul B. Borthwick** as personnel director. During the past 12 years, Mr. Borthwick has been associated in a personnel capacity with the Westinghouse Manufacturing Co., the U. S. Rubber Co., and the Osborn Manufacturing Co.

Hall Laboratories, Pittsburgh, is adding two analysts to its service laboratory group engaged in investigation of boiler water problems. **Mrs. Erla Wilhelm,** who served on the service laboratory staff as a boiler water analyst from 1945 to 1947, returns to that position after leave of absence. **Jerome A. Platte,** a chemistry major at St. Joseph's Normal Institute, Ammendale, Md., before entering the Army in 1943, joins the laboratory staff for similar duties.

The appointment of **W. W. Stuart** of Des Moines, Iowa, as manufacturer's agent for Nu-Way products in Illinois, Iowa, Kansas, Missouri and Nebraska has been announced by the **Nu-Way Corp.,** Rock Island, Ill. Mr. Stuart's association with Nu-Way is not new as he has handled its products for many years, though he has not previously represented it as manufacturer's agent.

The Trane Co., La Crosse, Wis., manufacturer of heating, cooling and air conditioning equipment has completed plans for the construction of an eastern branch factory at Scranton, Pa. This new plant will be used to meet increased demand for Trane convector-radiators. The building will be one-story, brick and cinder block structure 170 x 410 ft, with a total floor space slightly under 70,000 sq ft. It will be erected on an 18-acre plot, which will permit further expansion. Construction will begin immediately with completion scheduled for mid-year. The organization's headquarters will remain in La Crosse.

C. S. Stackpole of Baltimore, Md., has been appointed vice-president and general sales manager for Airtemp Division of **Chrysler Corp.** He was formerly manager of merchandising and domestic sales with Consolidated Gas Electric Light and Power Co. of Baltimore. He joined the Baltimore utility in 1928. Following graduation from Brown University in 1922, Mr. Stackpole was employed by Walworth Manufacturing Co. of Boston. He next entered the employ of Stone and Webster through the Blackstone Valley Gas and Electric Co. in Pawtucket, R. I. Mr. Stackpole then held various executive positions with several gas and electric companies in New England and was later transferred to the Virginia Electric and Power Co. as sales manager of the Norfolk district. He was promoted to divisional manager at Richmond for that firm but left them in 1928 to accept a position as assistant manager of merchandising with Consolidated Gas Electric Light and Power.

C. S. Stackpole

Howard E. Sill, vice-president of Muncie Gear Works, Inc., Muncie, Ind., has been elected secretary-treasurer of the **Stoker Manufacturers Association.** Mr. Sill succeeds F. H. Herndon of the Link-Belt Co., Chicago, who resigned after his company disposed of its stoker division recently to the Timken-Detroit Axle Company.

BARBER COLMAN

Control Systems for . . .

HOT WATER HEATING

Thermostatic Adjuster with outdoor bulb compensates for changes in outdoor temperature.

Hot Water Microtherm controls water temperature and is reset by Thermostatic Adjuster.

Motor-Operated Mixing Valve, controlled by Microtherm, governs water temperature.

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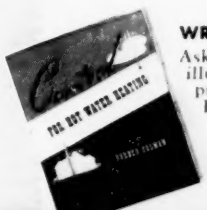

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Flexible Tubing Corp., organized late in 1947, has announced its entry into the flexible tubing field. Laboratory, design engineering and manufacturing facilities will all be centered in Branford, Conn. President and treasurer of Flexible Tubing Corp. is **Frederick K. Daggett**, former sales and engineering manager of the Spiratube Division of the Warner Brothers Co., Bridgeport, Conn. Secretary is **Joseph B. Morse**; New Haven attorney and member of the law firm of Pond, Morgan & Morse. Assistant treasurer, **Alexander K. Murphy**, was formerly of the New Haven Clock Co.

Dale D. Spoor has been appointed sales promotion manager of **Air Reduction Sales Co. Russell S. Schmidt** succeeds Mr. Spoor as dealer sales manager. As sales promotion manager Mr. Spoor's duties will include the supervision of a sales training program, and the establishment of sales promotion programs for the various Airco sales districts throughout the country.

Paul H. Rimbach, former sales manager of the Heating Controls division of Minneapolis-Honeywell Regulator Co., Boston, has joined the T. G. Colter organization, also of Boston, New England representatives of the **Dole Valve Co.**, Chicago.

James Clinton Peebles, dean of engineering at **Illinois Institute of Technology**, will retire at the end of August after an association with Illinois Tech and its predecessor institutions which extends over nearly a half century.

Announcement of the opening of a New York Office to handle Atlantic district sales of Peerless pumps is made by F. E. Fairman, Jr., vice president of the **Food Machinery Corp.** and General Manager of its Peerless Division. The New York Office is located at 37 Wall Street, New York 5. **R. C. Engemoen** has been appointed district manager in New York.

K. O. Williams for many years associated with N. O. Nelson Co. in St. Louis has been appointed direct factory representative of the **H. A. Thrush & Co.** in the territory comprising parts of the states of Illinois, Missouri and Kentucky.

Manufacturing and shipping facilities of the Norge-Heat Division of **Borg-Warner Corp.** have been expanded with the acquisition of a 150,000-sq-ft plant at Hammond, Ind. A complete line of oil-fired and gas-fired water heating and air conditioning equipment, floor furnaces and conversion burners will be manufactured in the new plant. The factory is expected to be ready for operation by midsummer.

The **Perfex Corp.** manufacturer of automatic temperature controls and industrial engine radiators, has announced the appointment of **Allen A. Putt** as eastern sales representative for the Controls Division and **Alfred B. Meeg** as manager of the Industrial Controls Division. In his new capacity, Mr. Putt will operate from the company's New York Office as a special sales representative. Mr. Meeg is successor to M. W. Crew who left Perfex to enter his own business.

At the 31st annual meeting of the **National Association of Fan Manufacturers**, the following officers were elected for the ensuing year: **R. A. Wasson**, president **T. J. Flanagan**, vice-president; **L. O. Monroe**, secretary-treasurer. Mr. Wasson is vice-president and general manager of Clarage Fan Co., Kalamazoo, Mich., and Mr. Flanagan is president of Garden City Fan Co., Chicago, Ill.

George E. Mills, of Cleveland, Ohio, has been appointed public relations director of the **Refrigeration Equipment Manufacturers Association.** Public relations offices of the association have been established at 3751 Prospect Ave., Cleveland, Ohio.

McQuay, Inc. Minneapolis manufacturer of refrigeration and air conditioning equipment, announces the appointment of **Russell E. Davis** of St. Louis, Mo., as its representative for the St. Louis territory. This consists of eastern Missouri, western Illinois and most of Iowa. Mr. Davis was southern Illinois sales representative for the Thermorite Corp.

McDonnell & Miller, Inc., Wrigley Building, Chicago, has announced the appointment of **Nils Swanson** as a vice-president of the corporation.

HEATING AND VENTILATING'S 1948 Buyers' Directory was in error in listing the name of Titus Manufacturing Company, as a Division of Associated Manufacturers, Inc., Waterloo, Iowa. The correct name and address of the company is Titus Manufacturing Corporation, Waterloo, Iowa.

COMING EVENTS

MAY 3-7, 1948 — 1948 convention and foundry show of American Foundrymen's Association, Philadelphia Convention Hall and Commercial Museum, Philadelphia, Pa. Alfred A. Hilbron, Hotel Sherman, Chicago, Ill.

MAY 6-7, 1948—Sixth annual Anthracite Conference, Lehigh University, Bethlehem, Pa. Prof. A. Copeland Callen, Department of Mining Engineering, Lehigh University.

MAY 18-21, 1948—39th annual meeting of National District Heating Association, Hotel Statler, St. Louis, Mo. Secretary, John F. Collins, Jr., 827 N. Euclid Avenue, Pittsburgh 6, Pa.

MAY 24-27, 1948—66th convention and exposition of the National Association of Master Plumbers, Philadelphia Convention Hall, Philadelphia, Pa. Association office 1105 K St., N.W., Washington 5, D. C.

MAY 31-JUNE 2, 1948—Spring meeting, American Society of Refrigerating Engineers, New Ocean House, Swampscott, Mass. Secretary, M. C. Turpin, 40 W. 40th St., New York 18, N. Y.

JUNE 1-5, 1948—Annual meeting, Heating, Piping and Air Conditioning Contractors' National Association, Hotel William Penn, Pittsburgh, Pa. Secretary, Joseph C. Fitts, 1250 Avenue of the Americas, New York, N. Y.

JUNE 20-24, 1948—Spring meeting, American Society of Heating and Ventilating Engineers, Mt. Washington Hotel, Bretton Woods, N. H. Secretary, A. V. Hutchinson, 51 Madison Ave., New York, N. Y.

JUNE 28, 1948—Mid-year convention, National Heating Wholesalers Association, Edgewater Beach Hotel, Chicago, Ill. Richard M. Colegrove, executive secretary, 2130 Keith Building, Cleveland 15, Ohio.

JUNE 29-30, 1948 — Mid-year convention, National Warm Air Heating and Air Conditioning Association, Edgewater Beach Hotel, Chicago, Ill. Managing director, George Boeddener, 145 Public Sq., Cleveland 14, Ohio.

SEPTEMBER 13-17, 1948 — Third Instrument Conference and Exhibit, Convention Hall, Philadelphia, Pa. E. J. Grace, Jr., general chairman, Instrument Society of America, 1117 Wolfendale St., Pittsburgh 12, Pa.

DECEMBER 9-11, 1948—Annual convention, American Society of Refrigerating Engineers, Hotel Statler, Washington, D. C. Secretary, M. C. Turpin, 40 W. 40th St., New York 18, N. Y.

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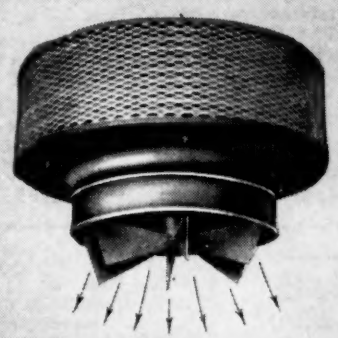

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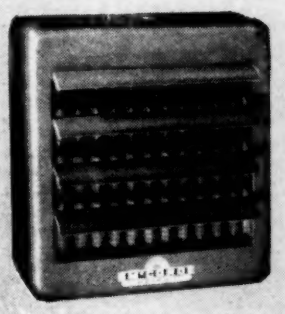

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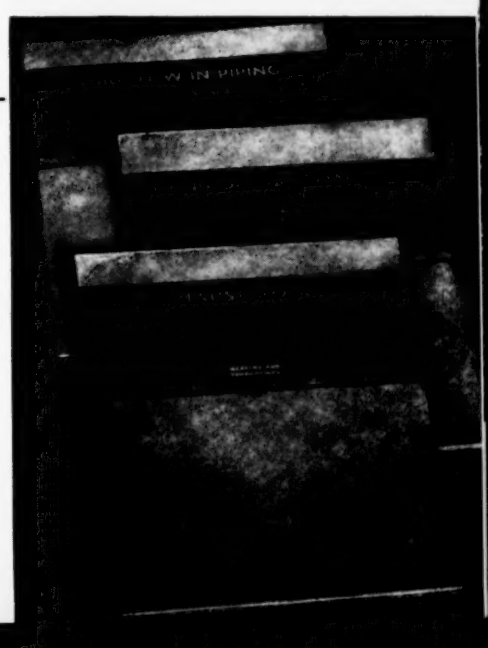

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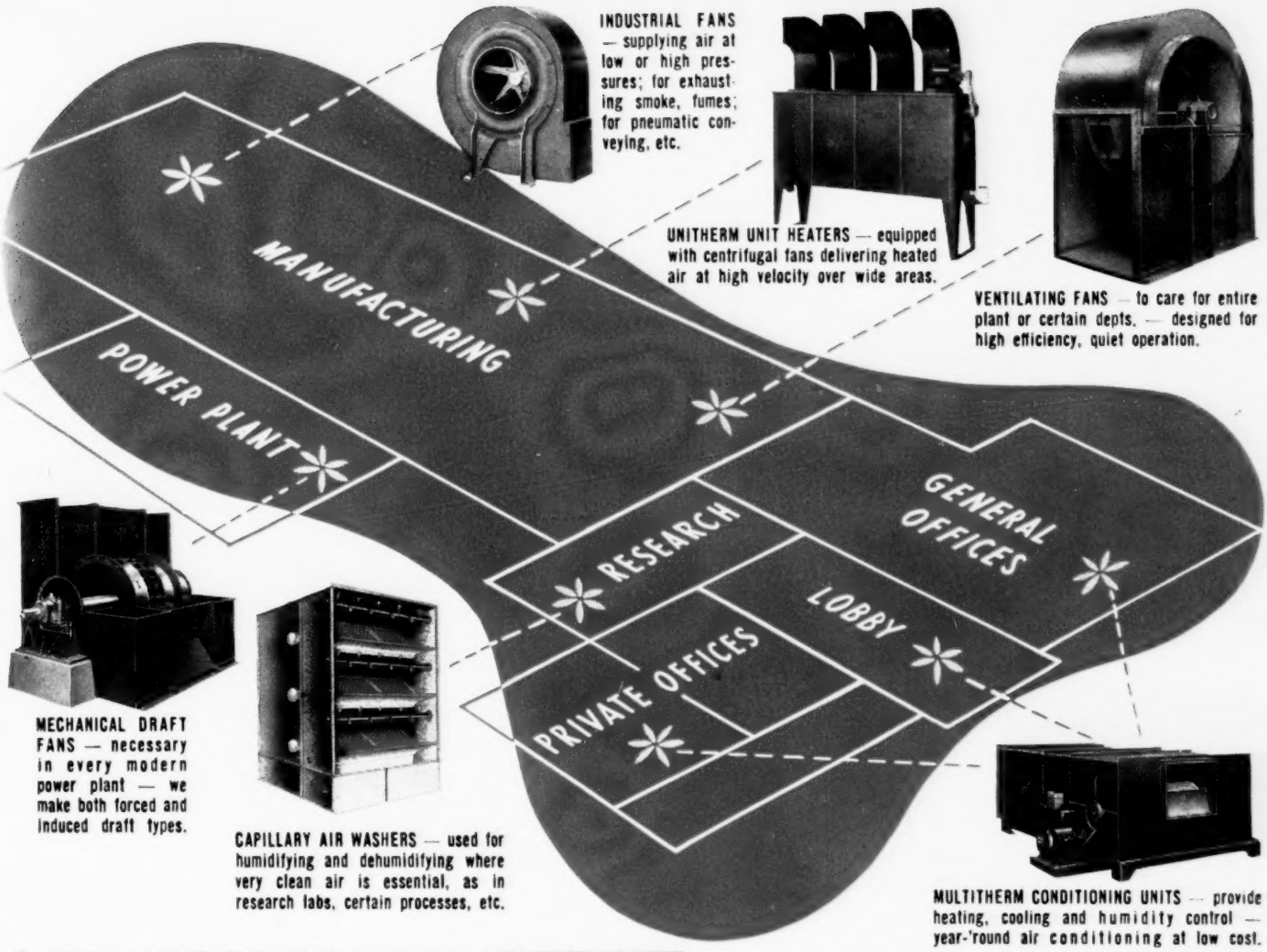

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Temperature conditions differ in each building. For control systems, custom-built to solve each problem, the call is for a nation-wide organization, Johnson Service Company, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

DESIGN · MANUFACTURE · INSTALLATION · SINCE 18 [illegible]5

OLOGY DEPARTMENT

MAY, 1948

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION

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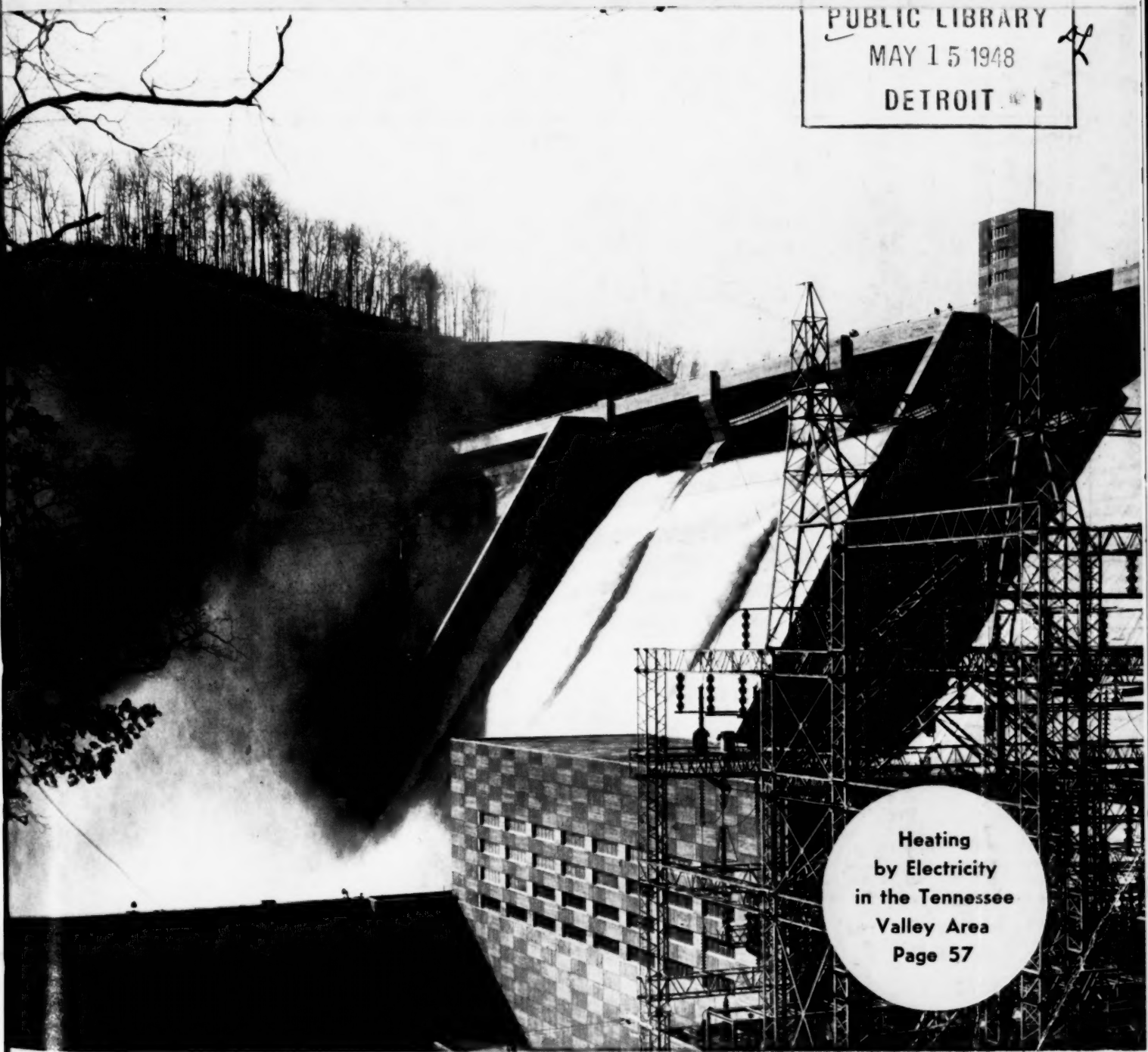


Heating by Electricity in the Tennessee Valley Area Page 57

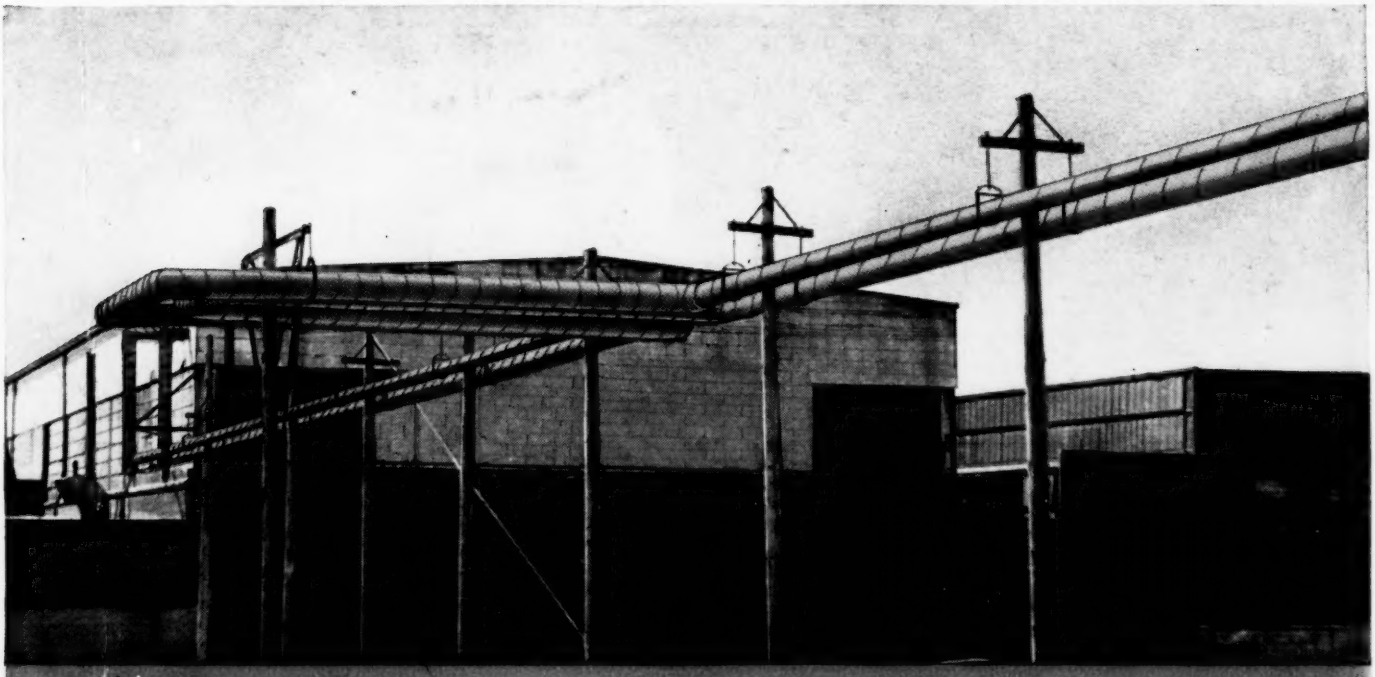
Part of the Norris Dam and powerhouse serving Tennessee Valley area with low-cost electric power.

Exhaust of Welding Fumes . . . page 69

Performance of Converted Boiler . . . . . page 65

Joining Thin Wall Tubes . . . page 84

Air Conditioning by Central System . . . . . page 81



RIC-WIL *Foilclad* PIPE UNITS

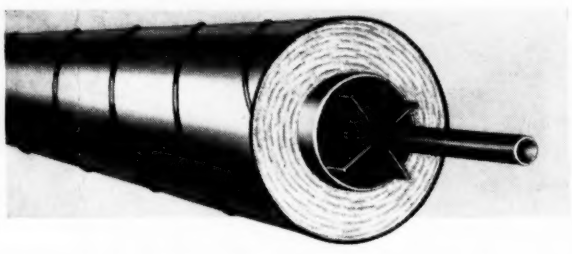
Combine Efficiency and Durability with Low Cost Installation and Maintenance

Factory prefabricated, insulated and weatherproofed, Ric-wiL Foilclad Pipe Units are especially designed for pipe distribution systems carrying oil and other viscous fluids, process liquids, refrigerants, steam or water.

Custom built to project specifications, Foilclad Units, in 21 ft, lengths, complete with odd lengths, couplings, and accessories as required, are delivered ready for immediate *single-handling* installation on arrival. The Ric-wiL Unit system reduces to a minimum the costly, tedious and frequently dangerous field work often involved in other types of piping installations.

Foilclad Units are designed so that field welding of pipe is a quick and easy operation. Several units at a time may be coupled on the ground before hoisting into position, eliminating a considerable amount of scaffolding.

More important, the Ric-wiL method of factory prefabrication and insulation—*exclusive with Ric-wiL*—assures a pre-tested, dependable, permanent system that eliminates ordinary maintenance and repair expense otherwise frequently required.



The insulated, jacketed pipe unit, above, is designed so that any required temperature can be maintained in transmitting fluids. Either pipe can be used to carry the process liquid while the other carries the heating or cooling medium, gas or liquid.

The outer pipe is covered with laminated asbestos insulation—or other type insulation as required—in any thickness desired. Insulation is machine coated with high temperature asphalt and tension-wrapped with asbestos felt, followed by second coating of asphalt. The final covering is a spiral tension wrapping of aluminum or copper foil bonded with the asphalt coating. The result is a rugged and durable unit, corrosion resistant and fully weatherproofed.

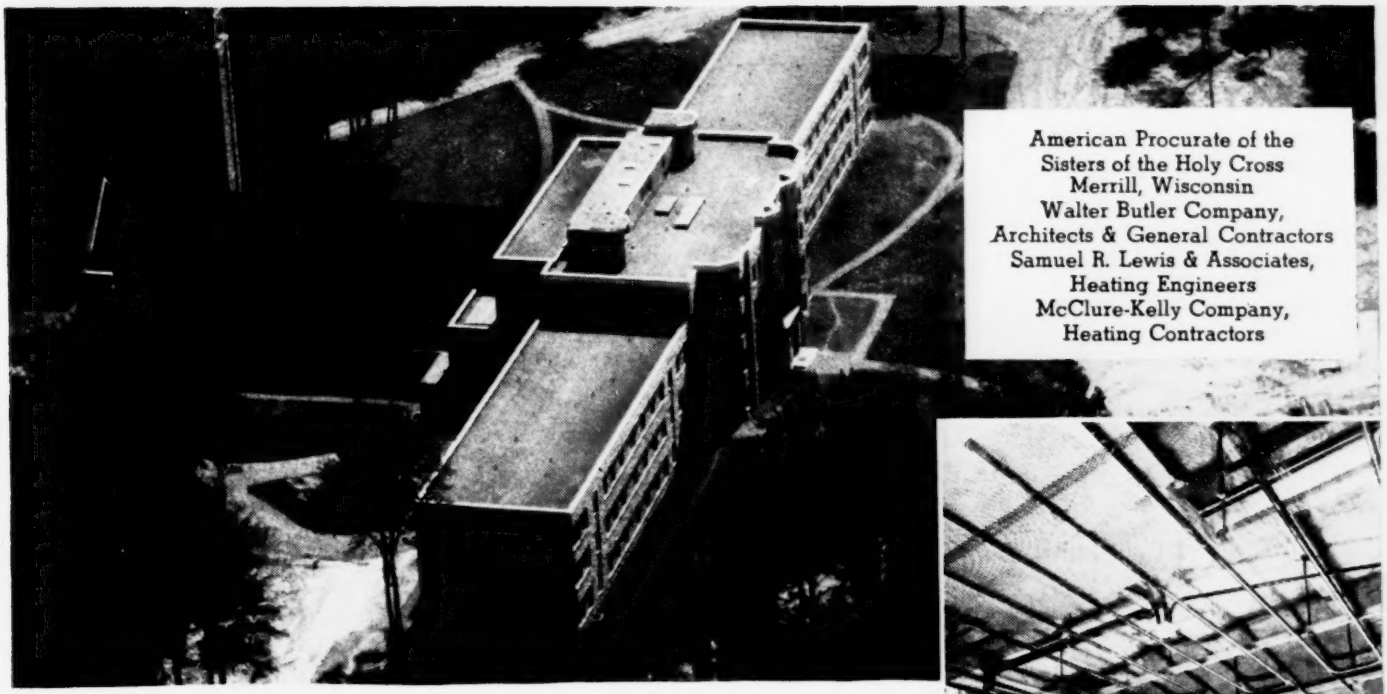
Write for Form 4708, for additional information on Foilclad and other Ric-wiL Units. Address The Ric-wiL Company, Cleveland, Ohio, Dept. 185

RIC-WIL

INSULATED PIPE CONDUIT SYSTEMS

THE RIC-WIL COMPANY • CLEVELAND, OHIO

CABLE ADDRESS: RICWIL, BENTLEY'S CODE



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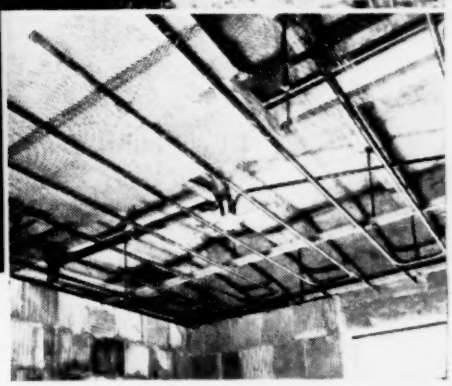


CEILING COILS

Design Temperature . . .

32° below zero

in this multi-story Radiant Heating installation with

BYERS WROUGHT IRON PIPE

Here is a radiant heating job with a number of unusual features.

. . . It is one of the largest multi-story installations made to date. Approximately nine miles of Byers Wrought Iron pipe was used for the system.

. . . It is located in the "deep-freeze" area; design temperature is 32° below zero.

. . . It includes residential, educational, office, and church areas in the one structure.

. . . It utilizes not only floor and ceiling coils, but grids installed under the stair runs to eliminate cold air currents in the stairwells.

The cruciform building is constructed of reinforced concrete with a stone facing. Arms of the cross house dormitories, offices and school rooms, are three stories in height, while the central portion is four stories. The chapel occupies the stem of the cross. Water, heated with steam in heat-exchangers, is circulated by pumps in four zones.

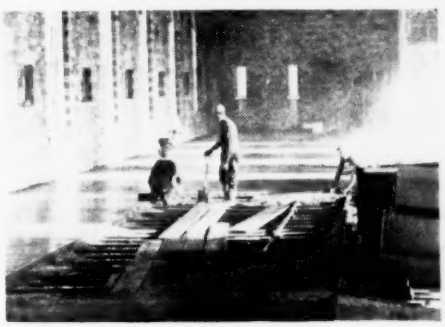
Radiant heating has proven itself remarkably successful in solving the difficult heating problems encountered in structures with large rooms and high ceilings, because it does not rely on high air temperatures to produce comfort. It is significant that, following inspection and investigation, radiant heating, with Byers Wrought Iron pipe, was selected by the Walter Butler Company for another large current project.

Wrought iron offers an unusual combination of benefits for radiant heating. It is readily formed and welded. It expands and contracts at almost identical rates with concrete and plaster. It has high heat emission. And its superior corrosion resistance has been conclusively demonstrated.

Our bulletin, "Byers Wrought Iron for Radiant Heating", gives the complete story. Ask for a copy.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N.Y.

STAIRWAY COILS



FLOOR COILS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS